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The Westinghouse Electric & Mfg. Co. and the Baldwin Locomotive Works have made a mutual agreement for concert of action in the development of electric motors for use upon steam railways. The successful operation of electric traction on steam railways in the cases of the Mt. Holly branch of the Pennsylvania R. R., the Nantasket Beach branch of the New Haven R. R., and the tunnel of the B. & O. R. R. underneath the city of Baltimore, indicates that the electric locomotive is about to find a large field of usefulness in suburban service, in small branch lines, in switching through crowded streets, etc., leaving to the steam locomotive, for the present at least, long distance freight and passenger service. An electric locomotive consists of two principal parts; first, the running gear, including the truck and its wheels, and the foundation, frame or bedplate for holding the electrical part of the structure; and second, the electric motor itself and its appurtenances. The first part can be most easily built by a concern which has an equipment adapted for ordinary locomotive building, the Baldwin works, the largest locomotive works in the world, being pre-eminent in this respect, and the electrical part should be built by a large electrical concern like the Westinghouse Co. The agreement between these two companies is an important step towards the development of the electric locomotive of the future.

An express train from Wilmington to Washington, D. C., on the Pennsylvania R. R., is said to have recently made a run of 35½ miles in 33 minutes, with a maximum of 5 miles in 3 minutes.

Trolley car fenders are said to have saved the lives of sixteen people in Philadelphia during the month of July.

The proper speed for trolley cars in cities is still agitating the citizens of Brooklyn. The Brooklyn Heights R. R. Co. has begun a suit to restrain the city authorities from enforcing the speed ordinance which was passed April 1, 1895, restricting the speed of cars to a six-mile rate within a radius of 1½ miles from City Hall, and to an eight-mile rate outside of that limit and within the first 28 wards of the city. The company alleges that on Jan. 11, 1892, the common council granted consent to operate the road by the trolley system and to run its cars at such a rate of speed as to enable it to secure to the public the advantages of better and more speedy transit, with due regard to safety, providing that it should not exceed 10 miles an hour, and declares that upon these conditions it spent $9,000,000 in making the change from horse to electricity. The mayor is stated to be opposed to any increase of the speed, and the board of aldermen have failed to take any steps to give the companies the relief they demand. There is every prospect of a fine legal controversy over the matter, and a good time for the lawyers, and the result of the suit, if it comes to trial, will be anxiously awaited by electric railway companies and by cities all over the land. There is apparently an irrepressible conflict between the companies and those who ride in the cars on one hand, and pedestrians who object to being run over by the cars on the other.

The American Line steamer "St. Louis" arrived at Sandy Hook on Aug. 3 with a record of 6 d. 17 h. 20 min. from Southampton, beating her own previous record by 1 h. 17 min. The daily runs in knots were 448, 478, 475, 465, 464, 457 and 261, a total of 3,048 knots, averaging 18.89 knots per hour. The "St. Louis" is still 10 h. 6 min. behind the best record from Southampton, or 6 d. 7 h. 14 min., which was made by the American Liner "New York" in September, 1894, averaging 21.10 knots. The Cunard steamer "Lucania's" best record, from Queenstown, 5 d. 17 h. 23 min., was made in October, 1894, her average speed being 21.90 knots.

A torpedo boat capable of making 27½ knots per hour is projected by Mr. Nat Herreshoff, of Bristol, R. I., and according to press reports he has offered to build such a vessel for the United States for $150,000. If the offer is accepted he will use in the construction of the new boat some of the principles which have been followed in the design of the yacht "Defender."

The two new battle-ships authorized by the last Congress are each to have machinery weighing 1,100 tons, designed to develop 10,500 I. HP. This is the result of a controversy between Chief Constructor Hichborn and Engineering Chief Melville. The first contended for a weight of 1,000 tons, and the latter for 1,200 tons and 11,000 I. HP., as necessary to secure a speed of 16 knots. The result is practically a compromise. The Secretary of the Navy has approved the plans for a two-story turret armed with 13-in. and 8-in. guns. The report concerning the weight of machinery also includes a recommendation that the armored belt around each ship shall not extend more than 5½ ft. below the water-line on a draft of 25 ft.

The first-class unarmored cruiser "Powerful," sister ship to the "Terrible," was launched at Barrow, England, on July 24. The "Powerful" is built of steel, copper-sheathed, and has a displacement of 14,200 tons and engines of 25,000 I. HP. She is 500 ft. long, 71 ft. beam and 27 ft. draft, with a contract speed of 22 knots, and a coal bunker capacity of 3,000 tons. She is protected throughout by a 3 to 4-in. deck, and will carry the following armament: Two 9.2-in. guns, 12 6-in. quick-firing guns, 16 12-pdr. and 10 3-pdr. quick-firing guns, and nine machine guns. The "Powerful" and "Terrible" will not be ready for commission before the spring of 1898. Each ship will require a crew of 894 officers and men, or 150 more than the largest English battle-ship afloat. As compared with other ships of this class, the next in displacement is probably the Russian cruiser "Rossia," of 12,200 tons, which is now building.

The steamer "Germanic," of the White Star Line, which has recently been fitted with new triple expansion engines, made her fastest trip last week, the time from Queenstown to Sandy Hook being 6 d. 23 h. 27 m.

The armored cruiser "Brooklyn," which has been on the ways at Cramps' shipyard in Philadelphia for two years, is to be launched in about two weeks. The "Brooklyn" is a similar vessel to the "New York," which obtained such favorable opinions from foreign experts in the recent naval review at Kiel. She has a belt of protecting armor at the water line, with a protected deck. Her armament consists of eight 8-in. guns mounted in four turrets, ten 5-in. guns, and 16 6-pdr. rapid-fire and machine guns. The cruising displacement is 9,153 tons; the maximum indicated horse power is estimated at 16,000; coal bunker capacity, 1,753 tons.

A lightship with two electric flash lights is to be stationed off Woods Holl, Mass., and is now being built by the Bath Ironworks, of Bath, Me. It will be 112 ft. long, 28.6 ft. beam, 13 ft. draft, and will have a freeboard of 23 ft. The frames will be of steel, and the sheathing will be of timber below the water line and of steel above the water line. The generating plant will be in duplicate. A screw driven by an engine of 800 HP. will enable the vessel to return to her position if shifted during a storm. The vessel will cost about $70,000.

The great dry-dock at Southampton, England, said to be the largest graving dock in the world, was opened on Aug. 3 with elaborate ceremonies. The new dock belongs to the London & Southwestern Ry. Co., which bought out the old dock corporation some four years since for £1,300,000. The dock measures 750 ft. in length on the floor, and is so constructed that it can be made 250 ft. longer. The entrance is 87 ft. 6 ins. wide at water level. The dock width is 112 ft. At high-water neap tides the dock has a capacity of 14,500,000 gallons, which, with a ship in, can be emptied in two hours by means of two of Gwynne's centrifugal pumps, capable of delivering 112,000 gallons per minute, the discharge being through two culverts 8 ft. by 6 ft. 9 ins.

The most serious railway accident of the week was a collision between the sections of a parted freight train on the Pittsburg, Fort Wayne & Chicago R. R., near Canton, O., Aug. 2, by which three men were killed and five injured. The men were riding in a furniture car, which was telescoped.——A train on the Pickering Valley branch of the Philadelphia & Reading R. R. was derailed near Phoenixville, Pa., Aug. 4. The engine struck a cow which was lying on the track, and the engine and several cars went down the bank. One man was killed and several were injured, some fatally.

An explosion of gas occurred in one of the blast furnaces of the Wheeling Iron Co., Wheeling, W. Va., July 31, and the coke and molten metal were hurled in all directions, starting several fires. One man was killed.

The accident on the Niagara Falls & Lewiston Electric Ry., mentioned in our issue of July 26, was, we are informed by a correspondent, not so serious as had been reported. The writer states that the train was carrying some of the President's friends, who had been invited to make a preliminary trip over the road, the train consisting of two flat cars and four trailers, borrowed from the street railway. It was moving slowly around some curves when the forward trailer (on which our correspondent was riding) left the rails, but did not go off the ties. The press accounts reported the names of the injured persons, but these seem to have been invented to lend an air of truthfulness to the exaggerated reports.

The lock gates of lock No. 17 on the Cornwall Canal, near Cornwall, Ont., which were carried away recently by the steamer "Ocean," were again carried away on July 26. The barge "Glenora" had just been passed down through the lock, and was moored to the bank, and the barge "Kildonan" was in the lock on its way up. The gates were all shut and the water was being let into the lock from the upper level. The lines of the "Kildonan" broke, and it plunged against the upper gates and carried them away. The volume of water in the level hurled the barge and the broken gates back on to the lower gates. These were new, having been put in since the "Ocean" disaster, but they gave way, and all plunged into the basin. The "Glenora" broke from her moorings and was thrown diagonally across the head of the locks, thus acting as a dam, and preventing the "Kildonan" from striking the gates of lock No. 16. The damage was repaired by July 31.

A great fire at Sprague, Wash., on Aug. 4, destroyed the railway station and store sheds, the large car shops of the Northern Pacific R. R., and a majority of the business buildings of the town, involving a loss of about $1,000,000. The town had a population of about 3,000.

Heavy rainstorms caused sudden and serious floods at Adelaide, Colo., and Socorro, N. M., on July 30. In the former place several buildings were wrecked and three persons drowned, and at the latter place buildings were carried away, the water mains and the track of the Atchison, Topeka & Santa Fe R. R. were washed out, and eight persons were killed.

A new highway bridge over the Lehigh river at West Bethlehem, Pa., has been reported defective by Mr. F. E. Schall, engineer to the commissioners.

An asphalt lining for the slopes and part of the bottom of the Queen Lane water-works reservoir, at Philadelphia, is recommended in the final report of Mr. John C. Trautwine, Jr., Chief of the Bureau of Water, and Messrs. Rudolph Hering and Maj. C. W. Raymond, U. S. A., Consulting Engineers. This report is dated Aug. 5. The preliminary report was made on June 17, 1895, and advised that the outer slopes of the embankments be decreased in steepness, as noted in our issue of June 27.

Frauds in connection with the building of two bridges over the Lachine Canal at Montreal are charged in the Canadian press. It appears from the Toronto "Globe" of Aug. 5 that in 1892 the Minister of Railways and Canals told Parliament that his engineers had calculated that the bridges would cost $170,000, including both substructure and superstructure. The amount already paid out on the substructures alone is $334,000, while the bills rendered ran up to $434,000. The Minister is criticised for allowing the work to be done by day's work, instead of by contract, and for giving out by contract the supplying of the labor. Of the tenders for supplying the labor, a commission of investigation reported that there was "considerable doubt whether those tenders were bona fide; in reality there may only have been one tender." The alleged frauds will probably be investigated at the next meeting of Parliament.

PORTLAND CEMENT CONCRETE FOR ARCHITECTURAL DECORATIONS.

Every one who visited the Columbian Exposition in 1893 carried away a sense of regret that the beautiful statuary and ornamentation of the great buildings were so perishable. Were it only possible to produce things like these in durable stone, at the same low cost that they were produced in plaster, what richness of architecture would be possible in our cities, great and small.

There is reason to believe that the possibilities in the use of concrete for decorative purposes have never yet been appreciated. Concrete well made of good materials will endure extremes of weather better even than many of the marbles and sandstones. The facility with which it may be cast in molds is of course well known. Its color may be varied within wide limits, and after the pieces are removed from the mold defects may be remedied or changes made by the sculptor with great facility.

But few examples of the possibilities in this use of concrete are in existence in this country. At the Columbian Exposition there was a remarkably fine statue of Columbus, molded in Alsen's Portland cement, and this was illustrated in our issue of Dec. 28, 1893.

A still more interesting example of ornamental work in cement was a concrete bridge erected at the Antwerp exposition in 1894, and illustrated by the accompanying engravings. The bridge was built by North's Portland Cement Works, which are located at a Flemish town about 30 miles from Antwerp, and have their main office in that city. This bridge connected two parts of the exposition grounds, which were separated by a street. The bridge has a two-center arch, with the springing line and abutments below the street level, there being a clear width of 60 ft. and a clear height of 14 ft. 9 ins. at the street. The width is 32 ft. 10 ins., and the total length of the bridge is 131 ft. 3 ins. The arch is 6 ft. 6¾ ins. thick at the haunches and 1 ft. 7¾ ins. at the crown. The abutments are 11 ft. 6 ins. deep and have a base 16 ft. 5 ins. wide.

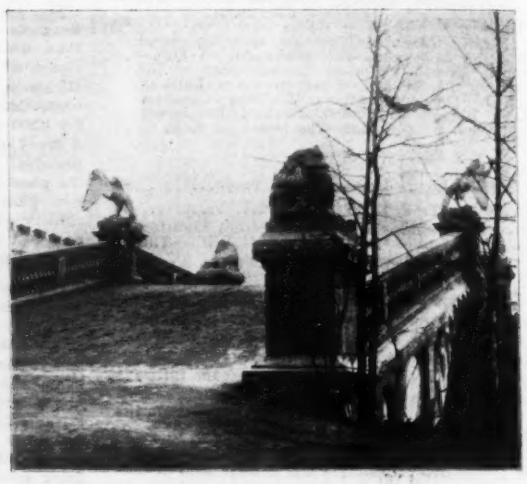
The excavations for the abutments were carried down to a depth of 10 ft. 9 ins. below the surface of the ground, and a wall about 3 ft. 3 ins. thick was discovered, crossing the site obliquely, but the depth of its foundation was not ascertained. This wall was a portion of the remains of the ancient fortifications, and it was removed down to about 3 ft. 3 ins. above the base of the bridge foundation. In excavating the northern part a brick pavement was discovered, and upon this the abutment rests.

The concrete of the abutments was composed of a mortar of 1 part of cement to 4 of sand, and 16 cu. ft. of this mortar was added to 35.31 cu. ft. of crushed porphyry, the proportion being 45 parts of mortar to 100 parts of stone. The mortar was made somewhat dry, containing about 10% of water. The concrete was rammed in layers 6 ins. thick, with rammers weighing 17½ to 20 lbs. It was molded on the old walls above mentioned, without any particular precautions, as the abutments form monoliths with great resistance to contraction and expansion, and it was considered that there would be no cracks or settlement due to the compression of the soil.

The concrete of the arches was composed of a mortar of 1 part of cement to 2 of sand, mixed with about 10% of water, and 16 cu. ft. of this mortar was added to 35.31 cu. ft. of crushed porphyry. The arch concrete extends 3 ft. 3⅜ ins. back from the inner face of the abutment. Work on the arch was commenced Dec. 18, 1893, and was completed on Dec. 23. Severe frost set in on Jan. 1, the thermometer indicating —14° F. The centering consisted of five timber trusses 6 ft. 6¾ ins. apart, with a lagging of ¾-in. planks. The centering was struck on Jan. 23, without any special precaution, the wedges being removed by carpenters, beginning at the middle of the arch. No settlement occurred, and a spirit-level placed at about 33 ft. from the crown of the arch disclosed no evidence of motion of the corresponding mark at the top of the arch. The concrete of the arch contains 1 part of cement to 8⅜ of sand and stone, while that of the abutments contains 1 part of cement to 15 of sand and stone. To protect the concrete from the entrance of rainwater, a coat of mortar composed of 1 part of cement to 1 part of sand has been applied to the extrados of the arch and the tops of the abutments.

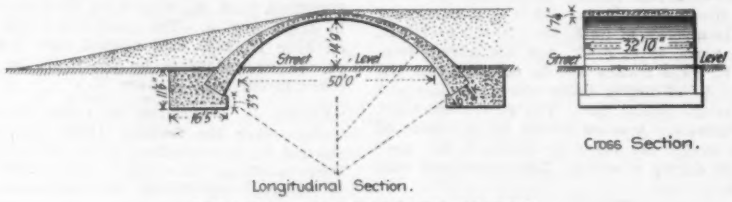
The perspective views of the arch given herewith show its very graceful design, but are on too small a scale to do justice to the very artistic pieces of statuary which ornament it at the abutment and crown, and which are also made entirely of Portland cement. We are unable to learn the exact manner in which the ornamental work was made, but presume the separate pillars of the balustrade were cast in molds and were then joined by a cement paste to the upper and lower rails. We are informed that the mixture employed for the ornamental work consisted of 250 parts of Rhine sand to 100 parts of Beerse Portland cement and 25 parts of yellow ochre.

We are indebted to Messrs. Edwin Hall & Co., of Philadelphia, Pa., the American representatives of North's Portland Cement Works, the builders of the arch, for the photographs and information from which our engravings and description are prepared.



VIEWS OF CONCRETE BRIDGE WITH ORNAMENTAL STATUARY AT THE ANTWERP EXPOSITION.

Built by North's Portland Cement Works, Antwerp, Belgium.



Longitudinal Section.

Cross Section.

SECTIONS OF CONCRETE BRIDGE.

DOUBLE SWING BRIDGE AT COLUMBUS ST., CLEVELAND, O.

(With Inset.)

We illustrate in the accompanying cuts and on our inset sheet this week details of a somewhat novel swing bridge, which has recently been completed over the Cuyahoga River, at Cleveland, Ohio. Briefly described this structure is a double swing highway bridge, operated by electricity and compressed air. The design of the bridge was the outgrowth of somewhat peculiar conditions. At Columbus St., where the structure is located, the river has a sharp bend and the old bridge with its center pier was very troublesome to vessels passing this bend. Moreover the old bridge had very steep approaches, and its abutments blocked access to valuable dock property. The problem was to eradicate the center pier and steep approaches, and to leave a passage to the dock property for the railway company owning it.

Fig. 1 is a diagram elevation of the structure designed to meet these requirements. As will be seen it is a double swing bridge, 279 ft. long over all, consisting of two 139½-ft. swing spans, with their pivot piers located just inside the dock lines and the ends of their long arms meeting over the center of the stream. The two swing spans are identical in design and construction with the exception of the center locking device, and a description of one span will answer for both. The heights of the trusses, width of waterway, and other general dimensions are shown on Fig. 1. Fig. 2 is a view of the bridge open and with the long arms turned toward the observer.

The design and construction of the trusses call for no detailed mention. They were calculated for a live load of 100 lbs. per sq. ft. of roadway and 80 lbs. per sq. ft. of sidewalk, or 3,000 lbs. per lin. ft. of bridge. In addition to the uniform load the roadway was figured for a concentrated load of 16 tons on four wheels. The material was all soft or medium steel, channel sections being used for chords and posts and eye-bars for diagonals. Before leaving the shops all metal was oiled, and after erection two coats of red lead were given the entire structure.

Each span is mounted on a rim-bearing turntable, with a drum 23 ft. in diameter and 3 ft. 3 ins. high. Mounted on the drum are two loading beams supported by spherical bearings on four cross-girders. These loading beams carry the

bridge. Fig. 3 is a diagram plan of the drum showing the disposition of the cross girders and their bracing, and Fig. 4 is a detail of a cross-girder and drum connection. It will be seen that the load is distributed to eight points on the drum. It should be noted also that the grade of the bridge is secured by a difference in the heights of the bearings for the loading beams, thus allowing the drum to turn in a horizontal plane. Fig. 5 shows the principal details of the drum, rollers, and turntable track. The tracks are rolled steel and were

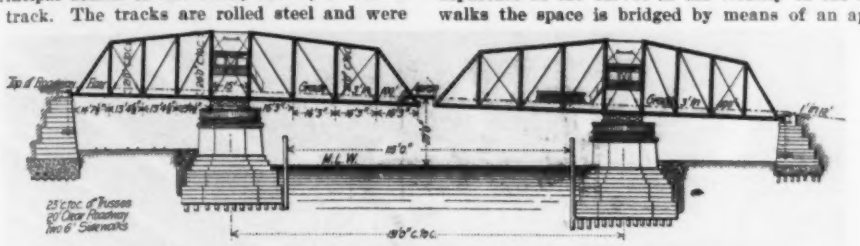


FIG. 1. ELEVATION OF DOUBLE SWING BRIDGE, CLEVELAND, O.
Walter P. Rice, M. Am. Soc. C. E., Chief Engineer.

leveled with a cement composed of seven parts sulphur and one part coal tar. All pinions and wheels are of cast steel.

The drum is revolved by means of the usual rack and pinion, with electric power. A 25-HP. Westinghouse, waterproof, multi-polar, railway type, electric motor operates a horizontal shaft, as shown by Fig. 6. Bevel gears at the ends of this horizontal shaft actuate the vertical shaft and pinion which turns the drum. The two motors for turning the bridge are enclosed in the drums, and mounted as shown by Fig. 6. A 5-HP. auxiliary motor for operating an air-compressor is located in one of the operating houses. The current is brought to the bridge from two power houses so as to have two independent sources of power, and is carried by armored, submarine cables running in a dredged trench between the center piers of the two spans. An emergency cable and a lead pipe for compressed air are also laid in the same trench. The cables are brought from the bottom, part way up the center pier, and then through a duct which leads through the center pin.

The 5-HP. motor operates an air-compressor pumping into two 25-cu. ft. receivers. This air is used to operate the end locking machinery and the pneumatic safety gates. Fig. 7 shows the locking device where the two spans meet, and Fig. 8 shows the locking and anchoring device at the opposite or shore ends of the spans. The locking devices at the shore ends of the spans are the same for both spans, but the center locking device is not, as will be readily understood from Fig. 7.

The ends of the spans meeting at the center of the bridge are convex, and the circle beams approach to within 4½ ins. of each other at the center line of the roadway. On account of the rapid departure of the curves in the vicinity of the sidewalks the space is bridged by means of an apron 5 ft. 4 ins. in length and extending the full width of the bridge. When this apron is raised the movement of the spans is unobstructed. Fig. 1 gives an idea of the location of this apron and Fig. 2 shows it raised at the end of the left-hand span. As will be seen it is hung on horizontal bearings and counterweighted to revolve easily. On the outer edges of these segmental counterweights are cast steel racks, which mesh with two spurs carried at the ends of a horizontal shaft, as shown in Fig. 7. This shaft is operated by the movement of the two steel plungers which pin the ends of the spans together, and the plungers themselves are operated by the pistons of two 11½ × 19½-in. air cylinders. A single movement of the piston serves to withdraw the plungers and lift the apron.

Similar air cylinders are used to operate the locking devices at the shore ends of the spans, as shown in Fig. 8. Fig. 9 shows the arrangement of the anchorage. The locking and anchoring device consists of a toggle driven slightly past its center by the piston of the air cylinder and fitting into two cup-shaped bearings forming a portion of the anchorage. The whole arrangement is so clearly shown by the illustrations that further description is unnecessary. It will be understood that only a single locking and anchoring device is shown, while there are four, two for each span.

In addition to the details already given and shown by the drawings of the turntable and operating machinery, it may be stated that hand power devices are available for operating all parts of the turning and locking mechanism if by any mishap the power machinery should fail. Safety gates, like railway crossing gates, built by Bogue & Mills, of Chicago, and operated by compressed air prevent access to the bridge when in motion, and powerful band brakes serve to check its motion at any time. The operating house for each span is located above one sidewalk and contains the controller, valves, and other devices for controlling the motion of that span. Fig. 10 is a view of the interior of one operating house showing the controller.

The substructure of the bridge consists of masonry piers and abutments resting on pile and grillage foundations. The piles were driven from 2½ ft to 3 ft. between centers, with an average penetration of 27 ft. and the grillage platforms of the center piers consist of nine and eight courses, respectively, of solid timber, drift bolted, and alternating in the proportion of two courses of oak to one of pine. These grillage platforms have side walls carried up and calked, thus forming a caisson in which masonry was laid, the caisson being sunk on top of the piles which were cut off 16 ft. under water. At the south abutment the conditions of a sliding bank with a 10% slope and the proximity of railway tracks with the constant jarring attendant upon the traffic, necessitated heavy masonry and thorough drainage. Berea sandstone was used in all of this work.

The quantities of material used in the construction of the bridge and the total cost of the bridge were as follows:

Total weight of superstructure, tons	427½
" cu. yds. of masonry	2,308
" " " " concrete	447
" lin. ft. foundation piles	12,223
" cu. yds. of excavation	4,800
" " " dredging	2,000
" oak timber in foundations, ft. B. M.	127,492
" pine " " " " "	90,452
" protection timber (temporary), ft. B. M.	34,536
" lin. ft. protection piles (temporary)	3,353
" " " " (permanent)	7,306
" " " " timber " ft. B. M.	22,802
" bolts and clamps, lbs.	46,710

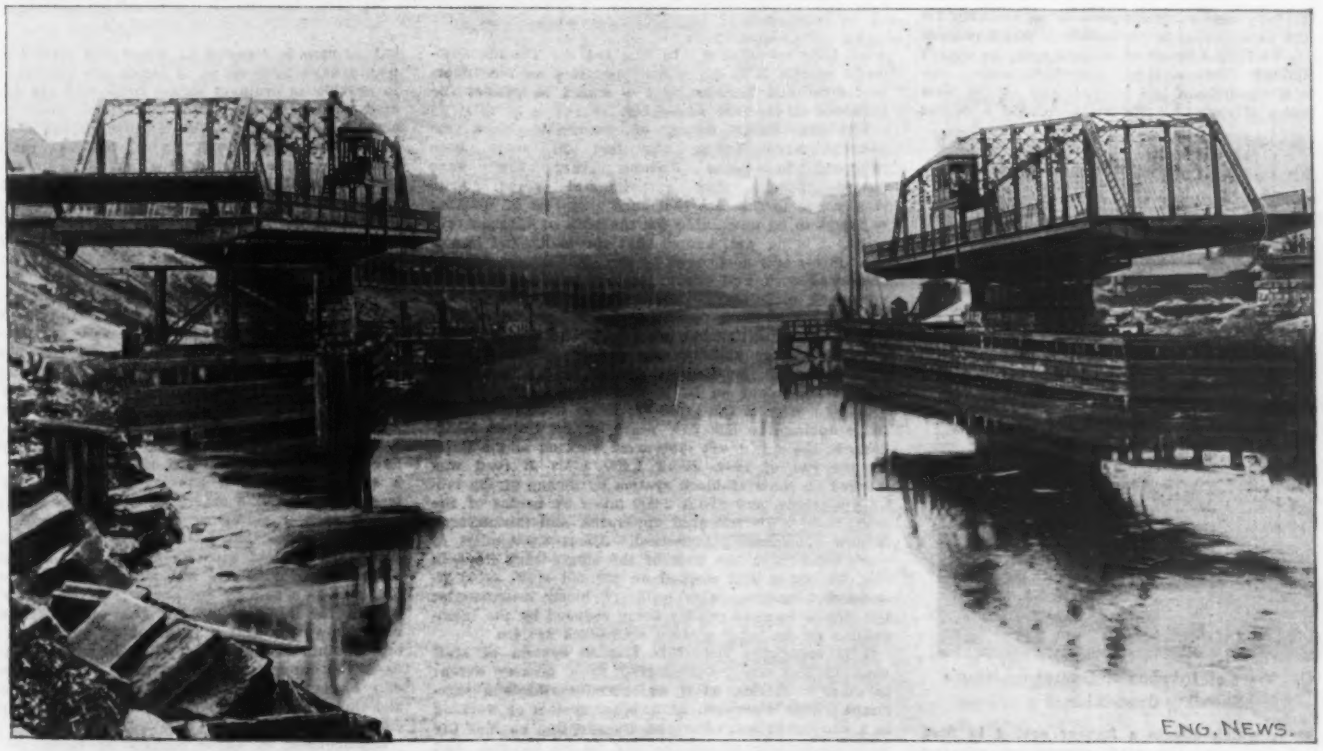


FIG. 2. VIEW OF DOUBLE SWING BRIDGE OPEN, SHOWING CONNECTING APRON ON LEFT HAND SPAN.

Cost of substructure, including sewer outlet	$46,000
" " superstructure	27,000
Electrical and compressed air equipment	5,000
Operating houses	592
Wires to bridge	500
Real estate	14,656
Paving approaches	2,000
Sewer	695
Total cost	$96,743

The work was executed by the following contractors: Substructure, Fisher & Fisher, Cleveland, O.; superstructure, W. H. Pratt, Receiver of Mt. Vernon Bridge Co., Mt. Vernon, O.; electrical and compressed air equipment, G. P. Nichols & Bro., Chicago, Ill. Much credit is due these firms for the careful work upon the structure and the interest which they at all times took in it. Special mention is also due to Mr. John Brunner, of the staff of the Mt. Vernon Bridge Co., who largely cooperated in making the structure a success, and to Mr. Wm. M. Hughes, M. Am. Soc. C. E., of Chicago, for valuable advice as consulting engineer. The structure was designed under the immediate personal supervision of Mr. Walter P. Rice, M. Am. Soc. C. E., Chief Engineer, and Mr. James T. Pardee, Assoc. M. Am. Soc. C. E., City Bridge Engineer, who was placed in charge of the work. We are indebted to the two gentlemen last named for the information from which this article has been prepared.

It may be stated in closing that the bridge has now been in operation several weeks and has worked successfully in all particuars.

RECENT PROGRESS IN RAILWAY SIGNALING.*

Recent Improvements in Block and Interlocking Apparatus, Chiefly from the Point of View of Economy in Initial Outlay.—In regard to the subject of interlocking apparatus, in the replies from the several railway companies only one apparatus is mentioned for the working of a double line railway, which can fairly be placed under the head "economy in initial outlay," and this apparatus, known as key interlocking, is described by the London & Northwestern Ry. Co., on whose system it has been employed to a large extent for the interlocking of unimportant stations, where the traffic requirements are such that no inconvenience is experienced in carrying the keys from the station frame to the siding points. This key interlocking system has also been introduced on the New South Wales Government Railways with very satisfactory results, and the system is generally spoken of as effecting considerable saving in the cost of interlocking, and well adapted for the special purposes for which it was designed. This same apparatus may be also utilized to a considerable extent for the interlocking of stations on single-track railways, but the appliance which perhaps more fully meets the requirement of economy for single-track interlocking is the staff key, which enables a siding to be fully secured at a small cost, no signals being required. This staff-key system is largely employed in Great Britain and Ireland, and on the New South Wales Government Railways, where a duplex

Fig. 10. View of Interior of Operating House Showing Controller.

lock is used, which effects a further saving in first cost. Unfortunately, the staff system of working single-track railways, which has during the last 30 years been employed with such satisfactory results on English railways, has made very slow progress in the colonies, India, or the United States of America, and consequently the staff key which forms part of the system cannot be employed.

* Abstract of a lengthy paper presented before the recent International Railway Congress, by Mr. A. M. Thompson, Signal Engineer of the London & Northwestern Ry.

Referring to the subject of "block apparatus" for double-track railways, no mention is made by English railway companies of any recent economical appliance in connection with block working, but several of the railway companies of the United States of America refer to the automatic block system, which appears to be making successful headway in that country. One of the systems in use, the Hall system, passed satisfactorily a severe test during the time of the Chicago Exhibition, the Illinois Central Ry. dealing with some 800 or 900 trains a day on its road, and its suitability as a block system under certain conditions of traffic

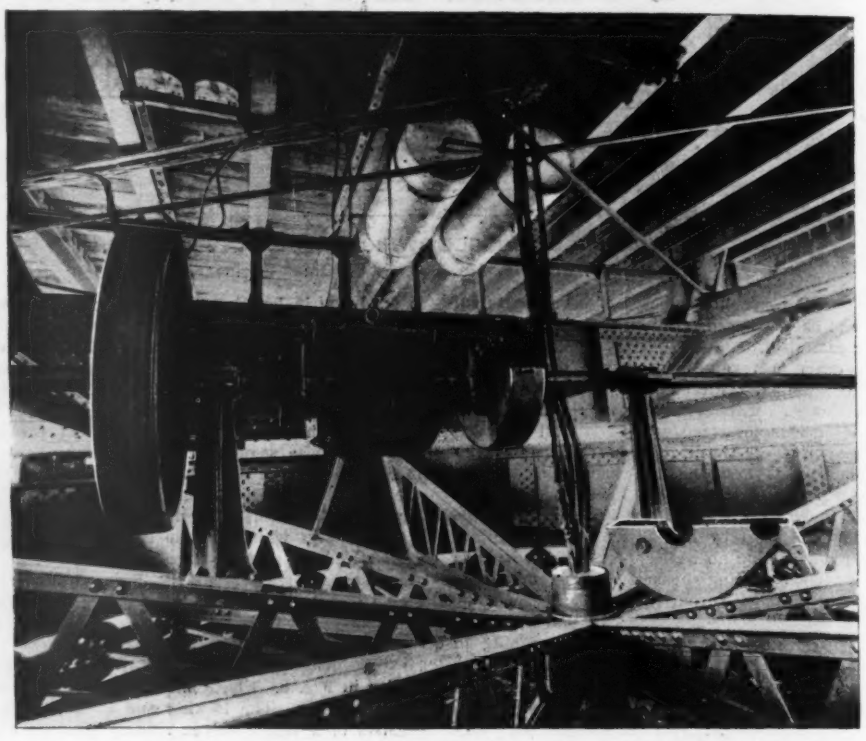


FIG. 8. VIEW OF INTERIOR OF DRUM, SHOWING MOTOR, AIR RECEIVERS AND CONNECTIONS.

were fully established. In England the Timmis automatic system is in successful operation on the Liverpool Overhead Railway, and is stated to answer the purposes of the line admirably.

Although many forms of automatic block apparatus have during the last 20 years been proposed in Great Britain, very few have passed beyond the experimental stage; principally due to the fact that such a system of working is found to be unsuitable for the bulk of English railways, it being well known that the many and important duties now performed by the signalmen cannot be dispensed with, and cannot be dealt with by means of automatic machinery.

In regard to block apparatus for use on single-track railways, as mention has been made of the key system of interlocking, and as this system of interlocking forms part of the English system of staff working, and is dependent on it, it may not be out of place briefly to refer to the rapid extension which has taken place during the last few years in the United Kingdom, in the staff-block system of working single lines. At the end of 1893, about 1,400 miles of road was worked on the staff-block system by means of the tablet apparatus, and about 2,000 miles by means of the more modern electric staff apparatus, and this mileage is now considerably increased. About 3,800 miles of road, comprising the bulk of the single-track lines in the country is still worked on the old staff, or staff-and-ticket system, with ordinary block instruments; but this mileage is rapidly being reduced by the introduction of the more modern staff-block system.

It is surprising that this English system of staff working has not been adopted to a greater extent in other countries, as it undoubtedly affords a safeguard which is secured by no other system of working to a similar extent. Further, its adoption enables the staff-key system of interlocking to be utilized, and its value as an economical and safe method of working a single-track railway is fully conceded by English railway companies and by the New South Wales Government Railways, the latter employing the system on about 1,000 miles of road, working these blocks at points on the road where no attendant is placed. For the working of the staff-block system one wire is required, and this same wire can be utilized for a telephone or ordinary telegraph communication.

Recently an apparatus has been introduced for working the staff-block system as a permissive block or "time system," to suit the requirements of several colonial railways, which cannot at present be worked on the absolute block system. This apparatus is constructed on the principle of the electric staff apparatus, and possesses all its advantages, including the key interlocking of points, and it can be used without alteration for absolute block working, thus avoiding any alteration of apparatus, should it be desired at any time to adopt absolute instead of permissive working.

Signals in Tunnels.—This question has been understood to refer to a special form of signals for tunnels, but no case is reported in which any special arrangements have been made, it being the general practice to provide an ordinary signal lamp with the usual colored glasses, or a ground disk signal, these forms of signals having up to the present proved themselves to be fairly satisfactory. In case of ill-ventilated tunnels, where the sight of a signal is likely to be obstructed by steam and smoke, a difficulty no doubt is experienced, but if the signal light is placed as close as possible to the ground, and a treadle gong provided to warn the driver of the position of the signal, some 150 or 300 ft. before he reaches it, the difficulty is fairly well met.

Methods of Preventing Collisions at Points of Danger on Express Lines in Case of Overrunning Signals.—The point of danger referred to has been understood to indicate specially the junction of two passenger lines. In the one direction the direction-facing point affords all necessary security, but in the other direction, as a rule, there is no point which can be utilized. In the United States of America a derailing switch is used, but such an expedient cannot be adopted in Great Britain, as the Board of Trade will only permit a safety siding on a passenger line, when it is at least a quarter of a mile long, and as the facing point which such a siding necessitates must be at a not greater distance than 540 ft. from the signal cabin, it would be in most cases impossible to adopt such an arrangement with one signal cabin, and security is obtained as a rule by not permitting two trains to approach the junction at the same time. It will be clear, however, that a point of danger may exist at other points of a line that at a junction, and in most cases the danger of a driver overshooting a signal can only be met by the vigilance of the drivers themselves and their careful selection and training by the railway company.

Replacement of Color Signals by Geometric Form Signals, in Order to Avoid the Danger Arising from Color Blindness or Defective Vision.—In giving their replies railway companies have evidently had some little difficulty in dealing with this question, inasmuch as no indication is given of the particular form or arrangement of lights suggested in lieu of our present colored lights. It appears, however, to be the general view that any addition to the present number of lights would be very confusing, more especially at busy junctions, where the lights are already numerous.

and it does not appear to be clearly seen how one light could by form only indicate with sufficient distinctiveness the signals "danger" and "track clear." Again, it is stated that only a very small proportion of the men who are periodically tested for color blindness are rejected, and no case is reported where the primary cause of an accident has been directly traced to color blindness. It is, therefore, the general opinion that our present system of colored lights is satisfactory, and that no alteration is needed.

Fog Signals.—No British railway company has yet adopted any system for automatically placing fog signals on the rails, as up to the present a satisfactory appliance has not been introduced, and the same remark applies to the British colonies and the United States of America. A great deal of ingenuity has been expended in providing a machine automatically to place detonators on the rail, or otherwise discharge them, but such arrangements have so far not proved altogether trustworthy, and have only partially met the requirements, as any such machine must have a fogman in attendance for recharging purposes, and as fogs come on at uncertain intervals of time, no such apparatus could be safely brought into use before examination if it had stood unused for any length of time, and the chief difficulty which railway companies now labor under in getting fogmen to their posts promptly in case of sudden fog is not met. Apparatus for discharging a detonator in the form of a gun cartridge on the locomotive, has proved more satisfactory, as such apparatus can receive daily attention by the shed fitters, but so far no scheme has got beyond the experimental stage.

The London & Northwestern Ry. has for some time been experimenting with, and is adopting, the Woodhead machine for mechanically placing the ordinary fog signals on the rails, or taking them off, exploded or not exploded, as occasion may require, and comprising likewise the following objects: 1, Increased safety to the men; 2, Dealing with the difficulty experienced in finding sufficient men; 3, Avoiding unnecessary explosion of detonators, conflicting signals, and consequent delay to traffic. The machine is of simple construction, worked with a lever by the fogman; it is permanently fixed close to the line of rails, and is kept in order by the ordinary maintenance gang. The majority of the machines contain a reserve of eight detonators, sufficient for four trains in succession, assuming all of them to require fog signaling, which is not the case in practice, and experience has proved—especially at distant signals—this reserve to be an ample one, as in many instances the same pair of detonators have been put on and taken off hundreds of times, and the necessity of crossing and recrossing intervening lines thus reduced to a minimum. By the use of these machines it has also been found that one man can in security do the work hitherto requiring two men in a situation otherwise favorable, but where difficulty was experienced in finding a sufficient number of men in the event of a continuous fog. These machines have been provided at several of the more important stations and the main line junctions, as well as on the four-line system in the vicinity of London and elsewhere. Machines of similar construction but for placing or removing one pair of detonators only at a time, have likewise been fixed at some of the outlying country distant signals. On four-line systems, by this arrangement the fogman has no longer to cross the intervening rails to reach the line for which he is signaling, so long as the fixed signal indicates the line clear, before the train has approached, the movement for taking the detonators off being so rapid that it can be performed even if the engine is only a yard or so distant.

These machines have been attended with success, and about 240 are already in use, some with the object of safety only, and others to enable one man to do with equal safety the work previously requiring two men, thus dispensing with the services of more than 100 men. The places dealt with include instances where the men had of necessity to cross more than two intervening lines, and the machines can be worked, if required, from signal cabins, platforms, or other elevated positions, and may likewise be placed where there is a moderate distance between two fixed signals working on separate posts for an up and down line respectively; by this arrangement a machine is placed on one of the lines about midway between the two signals, and the other line is worked by hand, one man attending to both; indicators are provided at the fogman's hut to intimate when the fixed signal is lowered. The saving in wages and cost of detonators, in the case of about 50 machines taken indiscriminately, for periods of fog lasting from two to four days, amounted to nearly $5 each. At the same time greater security was afforded to the men, as they had in the aggregate to cross the lines about 1,000 times only, instead of nearly 15,000 times under the ordinary system. In one instance the whole of the fast line traffic out of London was by the use of one of these machines fog-signaled for five days, during which time only fourteen detonators were exploded, and it was only necessary to cross the line four times, instead of 1,064 times.

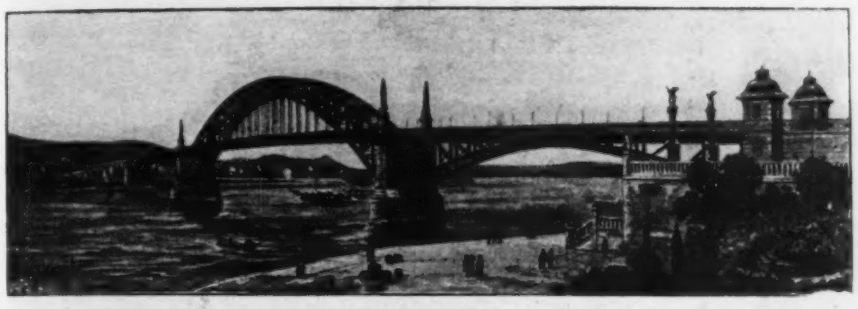


FIG. 1. FIRST PRIZE DESIGN FOR BRIDGE OVER THE RHINE AT BONN, GERMANY.
Submitted by the Gutehoffnungshutte Co., Oberhausen. R. Krohn, Chief Engineer; R. Schneider, Consulting Engineer; R. Mohring, Architect.

FIRST PRIZE DESIGN FOR BRIDGE OVER THE RHINE AT BONN.*

When it was decided to build a fixed bridge over the Rhine, connecting the city of Bonn with the village of Beuel, it was thought best, owing to the interests involved, to make it the subject of public competition, and designers were accordingly invited to make plans, which should be submitted by Dec. 31, 1894. The bridge, which was to be situated within certain boundary lines, was to be built perpendicular to the direction of the stream; it was to form a connecting link between the village and the passenger railway station in Bonn, and carry a street railway. It was required that a clear way for ships, 150 m. (about 492 ft.) wide, be left in the middle of the river, and one on each side, adjacent to the bulkheads, 60 m. (about 197 ft.) wide.

These conditions led to a bridge with three spans. The driveway was to be 8 m. wide (about 26 ft. 3 ins.), and the two sidewalks each 2.5 m. (about 8 ft. 2 ins.) when unobstructed by the trusses, and 3 m. (about 9 ft. 10 ins.) when adjacent thereto. The clear height over roadway was given at 4.8 m. (about 15 ft. 9 ins.), and provision was to be made for overhead passageways at different points. Buildings for the bridge tenders were to be located at each end. The designers were free to choose any style of truss, but the bridge should conform aesthetically to the features of the landscape.

The following loads were given: For main trusses: A uniformly-distributed load over roadway and sidewalks of 400 kg. per sq. m. (about 82 lbs. per sq. ft.). For floor system under roadway: (a) two four-wheeled wagons side by side, each 10 tons gross; (b) a steam roller weighing 13 tons; (c) street railway rolling stock, one motor followed by two cars. For the floor system under sidewalk, 500 kg. per sq. m. (102.4 lbs. per sq. ft.). Wind pressure where bridge was loaded: 150 kg. per sq. m. (30.7 lbs. per sq. ft.) of exposed surfaces of truss, and upon a traffic surface 2.5 m. (about 8 ft. 2 ins.) high, or 250 kg. per sq. m. (51.2 lbs. per sq. ft.) of surface for bridge unloaded. In all cases such position of load was to be assumed as would give the greatest stresses, and, in calculating cross-sections, the results of Wohler's experiments were to be taken into account. Secondary trusses, due to connections, were to be avoided as much as possible.

As to the character of the foundations, it had been ascertained by borings that the river bed was composed of stratum of gravel, 13 m. thick (42 ft. 8 ins), under which was a white clay for a depth of at least 21 m. (about 69 ft.).

The competitive plans which have been submitted number in all 16, one of which, however, is for a stone bridge, a class of structure not contemplated by the authorities. Four prizes were awarded on Jan. 7, 1895. The designs receiving first and fourth prizes are for braced arches, to cost respectively 3,207,000 and 3,500,000 marks ($763,600 and $833,400). That receiving second prize is for a suspension bridge, cost 2,600,000 marks ($619,000), while the third prize was awarded to a design for a truss bridge with carved upper chord, estimated at 2,460,000 marks ($585,700). The estimated cost of the stone bridge, which is given for comparison only, is 6,000,000 marks ($1,428,600).

The designs are all of unusual interest, both artistic and technical. The one that received the first prize, and which is illustrated and generally described in the following, was found to be submitted by the Gutehoffnungshuette Co., of Oberhausen—Messrs. R. Krohn, Chief Engineer; R. Schneider, Consulting Engineer, and B. Mohring, Architect. A view of this bridge, which crosses the river with three spans, is shown in Fig. 1. In the two shore spans the trusses are situated entirely below the roadway, while in the river span the latter is intersected by the bottom chord. It is believed that by this peculiar arrangement a favorable result, from an artistic point of view, has been obtained, inasmuch as the massive effect of the center span has been greatly modified and the whole brought to produce a harmonious impression.

The grade rises with an incline of 1 in 40 on the approaches and side spans, and the line of the floor on the center span is a parabolic curve, the floor at the center of this span being 1,272 mm. (about 4 ft. 2 ins.) higher than at the ends. The distance between the river piers c. to c. is 203.5 m. (about 667 ft. 8 ins.), while the center truss itself is 195.8 m. long (about 642 ft. 5 ins.), and divided into 25 panels. The versine of the bottom chord is 29.76 m. (about 97 ft. 8 ins.). Over the 19 central panels of this span the roadway is suspended from the arch, as shown, and the truss supporting it forms part of the wind bracing.

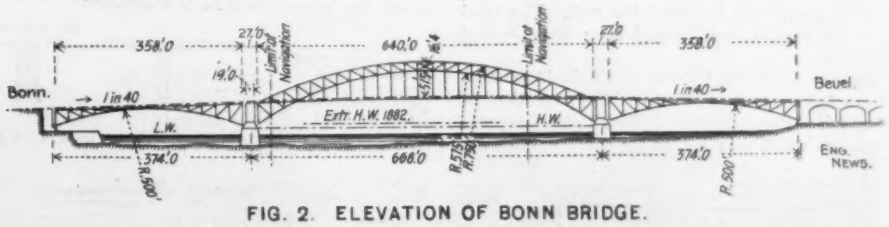


FIG. 2. ELEVATION OF BONN BRIDGE.

The shore spans are 110 m. long (about 361 ft.), and divided into 14 panels, the middle four of which have solid webs. The versine of the arched bottom chord is 9.92 m. (about 32 ft. 6 ins.). The straight top chord is parallel to the grade.

The floor beams, one at each panel, carry brackets on which the sidewalks are supported. There are five stringers under the roadway, and one at the extreme ends of the brackets; the latter supporting the sidewalks through cross-beams placed 1.56 m. apart (about 5 ft. 1 in.). The beams are covered by an iron plate, on which concrete and then asphalt are laid. The paving of the roadway is made of wooden blocks, laid in concrete, the weight being supported by buckle plates between stringers. The system of wind bracing and the details of construction are fully described and illustrated in the journal from which this description is taken.

The material chosen for the structure is open-hearth steel. In order to allow for shocks and vibrations, moving loads have been multiplied by 1.2

* Abstracted from the Journal of the Society of German Engineers, by O. J. Marstrand, M. Am. Soc. C. E.

and 1.3 in calculating main trusses and floor system, respectively, for the former the load was assumed to cover the roadway and one sidewalk only. Cross-sections, calculated from the vertical loading, were proportioned by the formula $K = 1{,}000\left(1 + \frac{1 \text{ min. } S}{2 \text{ max. } S}\right)$ kg. per sq. cm.; those calculated by adding the effects of vertical loading, wind-pressure and temperature change were proportioned for a strain of 1,500 kg. per sq. cm. (21,330 lbs. per sq. in.); those resisting wind stresses only for 1,000 kg. per sq. cm. (14,220 lbs. per sq. in.).

Columns are proportioned by Euler's formula with a safety factor of 5. The shearing value of rivets is taken at 4-5, and their bearing value at 8-5 of the allowable tensile stress. The following are the estimated weights of superstructure:

(a) For one shore span:

Roadway and railing, steel	214.2 tons
Main girders, steel	419.8 "
Wind bracing "	28.8 "
Cross bracing, "	3.6 "
Supports at ends, cast iron and steel	52.6 "
Total	719.0 tons

or about 2 tons per lin. ft.

(b) For the middle span:

Roadway, with adjoining wind girder and railing, steel	457.1 tons
Main girders, steel	1,059.3 "
Main wind bracing, steel	81.5 "
Cross bracing, steel	14.1 "
Supports at ends, cast iron and steel	63.8 "
Total	1,675.8 tons

or about 2.6 tons per lin. ft.

The total weight of metal superstructure in the whole bridge is therefore 3,113.8 tons.

The estimated cost is 1,074,000 marks ($255,700), or about $82 per ton. The cost of foundations, using cribs and stonework in piers and approaches, is given at 2,133,000 marks ($507,900), making a total of $763,600.

CHICAGO MAIN DRAINAGE CHANNEL.

XII.

Section 3, Lemont Division.

Section 3.—The first contract for this section was let to McArthur Bros., of Chicago, Ill., July 20, 1892, but trouble arose between them and the Sanitary District, as has already been described in the article on Sections 2 and 4, and in the compromise agreement which followed, the section was given to Gilman & Co.

According to the latest estimates there are 417,314* cu. yds. of glacial drift, 764,358* cu. yds. of solid rock, and 13,307 cu. yds. of retaining wall on the section. Of the glacial drift 73,310 cu. yds. had been excavated by McArthur Bros., under the original contract at 27 cts. per cu. yd. The prices received by Gilman & Co. are 56 cts. per cu. yd. for glacial drift, 76 cts. per cu. yd. for solid rock, and $3.25 per cu. yd. for retaining wall. The total cost of the section is estimated from these figures as $836,769.

Work was begun by Gilman & Co. in December, 1893, and during that winter the excavation of glacial drift was prosecuted with wheelbarrows, wagons and small cars loaded by hand, it being intended as soon as spring opened to establish an excavating plant suitable to the demands of the work. This plant as finally established consisted of a system of tramcar tracks, steam shovels and inclines for taking out the glacial drift, and inclines and Lidgerwood traveling cableways for removing the rock. The general layout of the plant as it stood in December, 1894, is shown in Fig. 53.

* These figures are only approximate, as the glacial drift has not all been removed, and the exact surface of the rock is unknown.

Taking up the excavation of the glacial drift first, Fig. 53 shows the plan of operation. Having been loaded by the steam shovel, the cars are hauled in trains of two cars to the foot of the incline by horses, the tracks being always laid so that this haul is down grade. At the foot of the incline the horses are detached and the cars hauled to the top by a Mundy 60-HP. hoisting engine, with a ¾-in. rope. At the top a team is again attached and the cars are hauled to the dumping ground, and thence to the point A, where they are let down a second incline into the pit by means of a rope and snubbing post. At the bottom of the incline horses are again attached, and the cars are taken to the steam shovel. The cars are rated at 3 cu. yds. each, and are hauled in trains of two when loaded, and in trains of from four to six when empty. Of course, as the dump becomes filled the track AA has to be moved out, and in the pit similar changes are made as the shovel takes a new cut. A Victor steam shovel, built by the Toledo Foundry & Machine Co., Toledo, O., is used for filling the cars. From figures obtained from the monthly reports of progress made by the Superintendent of Construction, the following statement showing the output of this shovel for several months is abstracted:

Month.	No. 10-hour shifts.	Cu. yds. exc. per shift.
September, 1894	21	362
October, 1894	24	316
November, 1894	18	333
December, 1894	25	392
January, 1895	17	235

In addition to the steam shovel work considerable glacial drift was excavated by hand labor, loading into small cars of 1 cu. yd. capacity, and hauling up the same incline used by the larger cars. The arrangement of the tracks for this portion of the work is clearly shown by Fig. 53. To permit of the small, narrow gage cars using the incline, a third rail was laid outside the broad gage track, and this rail and one rail of the main track used for the narrow gage track. The small cars were hauled in trains of five cars.

As a matter of novelty, it may be noted that for a time one of the cableways designed for the rock work was put at work handling glacial drift, the skips being loaded by hand. This cableway was worked for 61 shifts in September and 56 shifts in October, and averaged 188 cu. yds. and 255 cu. yds. per shift, respectively, for these two months.

Most of the rock excavation will be done by means of Lidgerwood traveling cableways, but a considerable amount of rock was also handled with an incline, as shown in Fig. 53. Cars of 1½ cu. yds. capacity, working in a rock face 5 ft. deep, were used, and are stated by the contractors to have given very satisfactory service. These cars were hauled by teams and hoisting engines, as in handling glacial drift, three car trains beings used. All the material excavated by means of inclines was used to grade a roadway for the cableway tracks.

The four cableways are operated so that two excavate the first face and two the second face; Nos. 2 and 4 working east and Nos. 1 and 3 working west from the center toward the ends of the section. These cableways are of the same general design as all the others working on the canal, with the exception of the aerial dumping device, invented by C. M. Mullinix, Supt. for Gilman & Co., which was described in the article on cableways

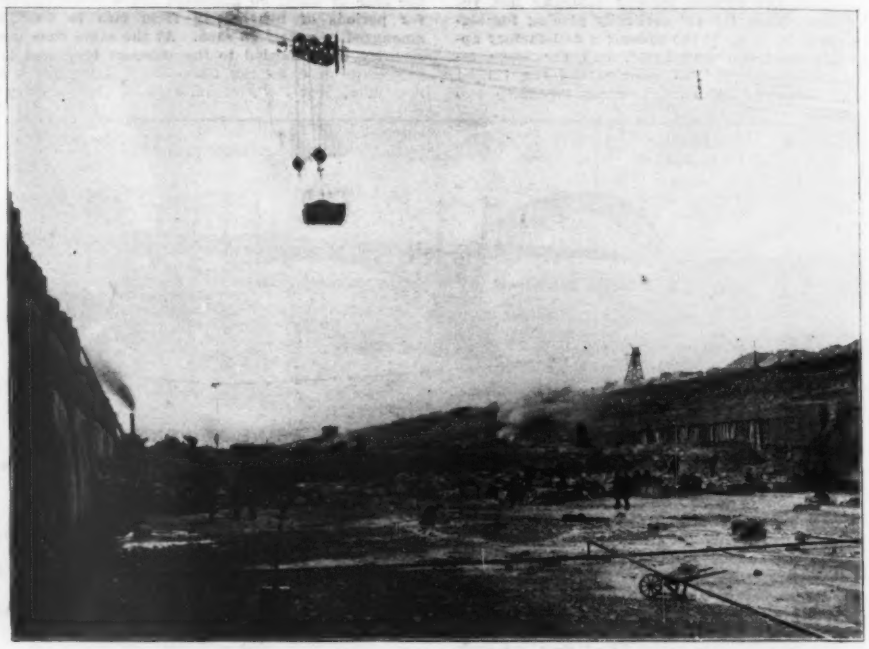


FIG. 54. WORKING FACE AND CABLEWAY EXCAVATING ROCK, SECTION 3.

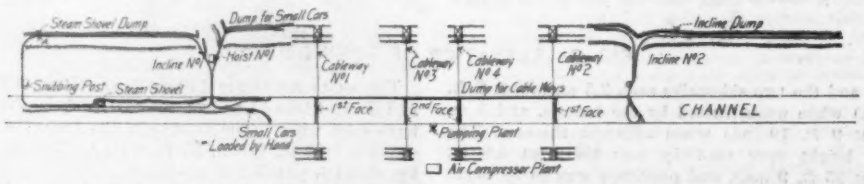


FIG. 54. PLAN OF TRACK SYSTEM SHOWING METHOD OF EXCAVATION ON SECTION 3.
Gilman & Co., Mount Forest, Ill., Contractors.

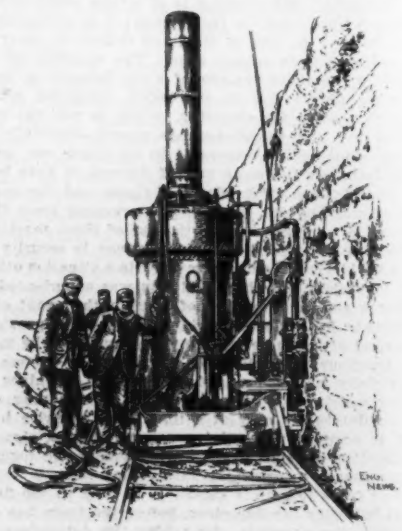


Fig. 55. Sullivan Channeller Cutting Side of Rock Channel, Section 3.

(Eng. News, July 25). This special form of dumping device was required on this section by the necessity of spoiling the material on both sides of the canal, and by its use the skips can be dumped on either spoil bank at will without any change in the machinery.

From the reports of the Superintendent of Con-

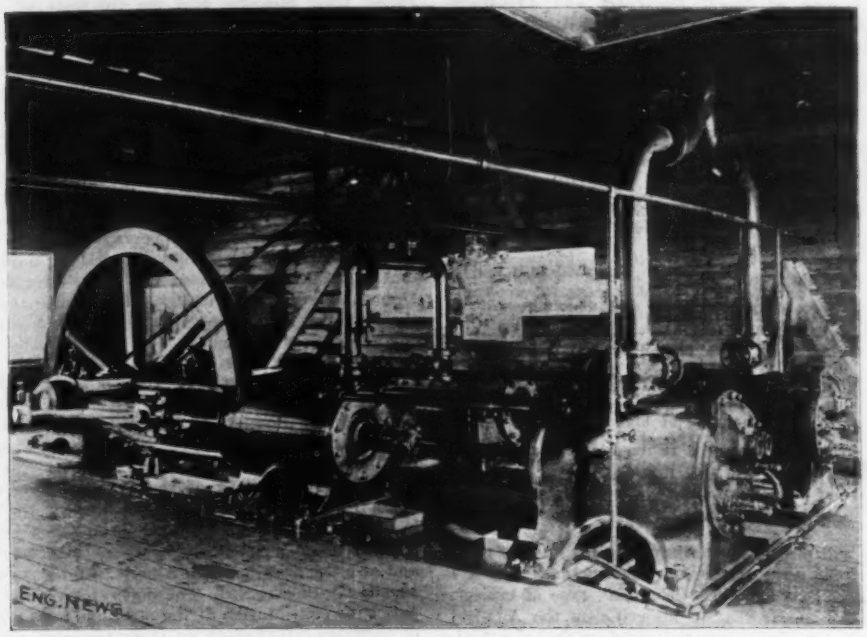


FIG. 56. DUPLEX 18 × 30 INS. RAND AIR COMPRESSOR FOR RUNNING AIR DRILLS, SECTION 3.

struction, the following figures of the work of these cableways for a number of months are taken:

Month.	No. 10-hour shifts.	Cu. yds. exc. per per shift.
September, 1894	126	294
October, 1894	140	267
November, 1894	153	290
December, 1894	140	305
January, 1895	173	161

A report from the contractors covering all four cableways for the month of May, 1895, gives the following figures:

per ten-hour shift. It will be noticed that the two independent records kept by the contractors and the engineers of the Sanitary District agree very closely. The contractors' figures show the average skip load to have been 1.6 cu. yds Assuming the number of laborers worked on each face to have been regularly 36—the intended number—the average output per man per ten-hour shift for all four cableways for the month was 8.49 cu. yds.

The following table shows the number of men worked and wages paid for these same four cableways:

No. skips worked on face	9
No. laborers worked on face	36
No. foremen worked on face	1
Wages, laborers per ten-hour day	$1.50
" foreman " " " "	3.00
" firemen " " " "	1.65
" towermen " " " "	2.50
" engineer " " " "	2.75

	Cableway No. 1. Day shifts.	Cableway No. 1. Night shifts.	Cable way No. 2. Day shifts.	Cable way No. 2. Night shifts.	Cableway No. 3. Day shifts.	Cableway No. 3. Night shifts.	Cableway No. 4. Day shifts.	Cableway No. 4. Night shifts.
No. skips handled	3,869	3,579	4,991	4,562	4,384	4,212	4,602	4,334
Cu. yds. excavated	6,031	5,727	7,985	7,208	7,012	6,740	7,361	6,935
No. hours worked	199½	195	231	219	242	237½	249	229
Cu. yds. per ten hours.	301	292	346	333	288	284	296	303

Lumping together the work of all four cableways, these figures give an average output of 305.3 cu. yds. per ten-hour shift for each machine for the month. The report of the Superintendent of Construction gives this same output as 306 cu. yds.

Fig. 54 is a view showing one of the working faces and a loaded skip on its way to the spoil bank.

It should be noted that the cableways on this section are worked night and day, and that no delays are counted out, unless the men are actually laid off without pay. Both of these conditions tend to reduce the apparent daily output of the cableways. In other words, it is more economical to work day shifts only, repairing and changing machinery nights, than it is to work double shifts—day and night shifts—when time must be taken out of actual working hours to make repairs. Moreover, if all these short delays are counted out, aggregating, say, two or three hours a day, the machines show an exaggerated output per ten-hour shift, per month or year. These two methods of manipulating the records are independent of any justifiable differences in the outputs of different machines, due to favorable or unfavorable physical conditions, or good or bad management.

This point is brought up here because certain of the contractors count out all delays, while others count out only those of one-half a day duration or more. Comparisons of the figures of the output of different cableways, it will thus be seen, may lead to unfair conclusions if care is not taken to determine the exact conditions. These conditions will be given as far as possible in all articles relating to the output of the various machines on the canal, and should be considered in comparing the work of one section with another.

The channel is cut ahead of the cableways by eight Sullivan channelers, two ahead of each machine. Fig. 55 is a view of one of these channelers at work. The four channelers ahead of cableways 1 and 2 take a 12-ft. cut, and the four ahead of cableways 3 and 4 an 11-ft. cut. These machines are very extensively used all along the rock section of the channel, where a cut from a few inches to 25 ft. in depth on both sides has to be made. The variable character of the rock in which these cuts are made has necessitated unusually heavy construction for the channelers, but otherwise they require no especial mention. In future articles records of the work of some of the channeling machines used on the canal will be given.

Rand drills are used, three for each cableway face, and they receive their air from an 18 × 30-in. duplex compressor, built by the Rand Drill Co. Fig. 56 is a view of the compressor plant. A single row of holes across the canal is exploded at one shot. An instantaneous view of a blast made on this section is shown by Fig. 57. In taking this photograph the camera was placed about 200 ft. from the blast, and the time of exposure was 1-50 of a second. Nearly 2,000 lbs. of powder per day is used on the four faces.

We are indebted to the contractors, Gilman & Co., and to the engineers of the Sanitary District for much aid in securing the matter from which this article and the illustrations have been prepared.

FIG. 57. INSTANTANEOUS PHOTOGRAPH OF A BLAST ON SECTION 3. Copyrighted by Chas. Stadler, Photographer, Chicago.

The utilization of the by-products of coke burning is the object of a company recently organized in New Jersey, under the name of the Bee-Hive Coke Oven By-Products Co., in which Mr. Delano, Vice-President of the Lackawanna Iron & Steel Co., is interested. At the Lacakwana Iron & Steel Co., is interested. The ovens are of European invention.

ENGINEERING NEWS
AND
AMERICAN RAILWAY JOURNAL.

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We pointed out, in our issue of July 25, that the elastic limit of a piece of steel might vary several thousand pounds according to the manner in which the test was made. A correspondent, in another column, presents a record of tests made on pieces cut from the same bar of steel by seven different steel works, and shows that by these independent determinations the elastic limit varies from 37,200 lbs. to 42,400 lbs., or from 52.1 per cent. of the ultimate strength to 72.9 per cent. of that quantity. The importance of this evidence to engineers who are drafting specifications for structural steel is too obvious to require comment.

The Carnegie Steel Co. has recently issued a circular letter to inspectors of structural material in which it complains that delay in the delivery of material is caused by the inspectors waiting until the material has been placed on the shipping beds before making the surface inspection, and it states that hereafter the surface inspection will be required to be made at the time of rolling, and at a place between the rolls and the shipping beds, and that no material is to be rehandled on the shipping beds for the purpose of inspection. They say further:

> In the event of your not being able to have a representative present at the time of rolling (day or night), we will agree to make this surface inspection ourselves and furnish you with a certificate to that effect, guaranteeing to replace any material found to be defective after shipment.

Naturally the inspectors are protesting against the new regulations, and are advising the purchasers of materials not to submit to them. One firm of inspectors insists on proper facilities being given for surface inspection, and makes a demand as follows:

> That you provide sufficient space at the various mills to allow the turning of all material after it has become thoroughly cooled, straightened, cut to length and properly stamped with blow numbers and marked for identification.
> There is not sufficient room inside these mills to conduct our inspections as outlined above, and therefore that you handle the material for us in the manner that we require.

The idea that surface inspection of material can be properly done at night and by the representatives of the mills themselves, instead of by inspectors paid by the purchaser, will strike most engineers and contractors unfavorably, and it would seem advisable for the Carnegie company to provide ample facilities at some point between the rolls and the shipping beds, if the latter are overcrowded, where the inspection may be made by daylight.

The performance of the U. S. triple-screw cruiser "Columbia," in her recent trip from Southampton to Sandy Hook in 6 d. 23 h. 49 min., or 6 h. 29 min. greater than the time made by the "St. Louis" is made the text for renewed criticism by Read-Admiral Meade of the type of vessel to which the "Columbia" belongs. It will be remembered that in Admiral Meade's paper, read before the Society of Naval Engineers and Architects last winter, he criticised this type of vessel in these words:

> The vessels that seem to be the least satisfactory to the practical men of our profession are the "Columbia" and the "Minneapolis." . . . It is feared that vessels, like the "Majestic" and "Teutonic," for instance, may laugh at our three-screw racers, which cannot cross the ocean at the same speed these commercial greyhounds maintain year in and year out.

In his present criticism, according to an interview with a reporter of a New York daily paper, the Admiral says:

> The ordinary coal capacity of the "Columbia" is 1,700 tons, but for this record voyage 325 tons additional were taken on board and distributed about the ship in temporary bunkers. To keep her maximum speed, she must consume 500 tons a day, so that it was necessary to make temporary bunkers in space which properly belonged to the crew, and difficulty was experienced in getting the coal to the boilers. In addition, the armament of the "Columbia" is not what it should be, for she was constructed as a compromise between the type of highest naval efficiency and the commerce destroyer. She falls just short of being either, and the speed attained in this last voyage shows that she cannot cope with such steamships as the "St. Louis," "Paris" and "New York," to say nothing of the "Campania" or "Lucania." As a cruiser, the "New York," with her heavy armament, could blow her out of the water.

We will probably soon have a reply to this criticism from some our naval constructors, who are strong believers in the "Columbia" type of cruiser. It would appear that in his criticism the Admiral has left out of consideration the fact that the "Columbia" was not expected to be a very high-speed steamer, except under forced draft, and we understand that only natural draft was used in her recent trip. She was not built especially for high speed for a long distance, but rather for economical performance for long distances at low cruising speed, with only one of her three engines running, and for high speed in emergencies, as when pursuing a high-speed merchant vessel or running away from an enemy's cruiser of greater offensive power. We do not see that her failure to make the transatlantic trip in less time than the "St. Louis" at all proves that she cannot beat that vessel in a short run with forced draft.

The projected consolidation of the Northern Pacific and Great Northern railway systems, under one management, is arousing, as might be expected, more or less public opposition in the Northwest. Mr. E. V. Smalley, the President of the St. Paul Chamber of Commerce, has recently published a long statement in which he sets forth the constitutional and legislative obstacles in the various Northwestern states to the consolidation of competing railways. He warns the bankers of London and Berlin that if they find any way to evade these obstacles,

> an indignant public sentiment will demand the assembling of state legislatures in special session to pass penal laws for the enforcement of the provisions of our civil codes. . . . If the bankers of New York, Berlin and London imagine that they can rob us of the advantages of railway competition they will find to their cost that they have made a very serious mistake. They will be wise if they abandon their scheme at once and return to their yachts and their country houses; their millions will not prevail against a vigilant and indignant public opinion.

We wonder if Mr. Smalley understands how large a task the people of the Northwest have undertaken when they say that competition shall be kept alive by process of law. Suppose two merchants in a country town do not choose to compete with each other. Is there any law, civil or penal, which any legislature can pass that will compel them to do so? Suppose the stock of two railway corporations is owned by a single syndicate of bankers. Is there any law which can compel them to keep their two roads cutting each other's rates in perpetuity?

Mr. Smalley and the "public opinion" he represents forget that there are stronger laws than any that are written in statute books, and one of them is the economic law that "destructive competition ends in consolidation." This law can no more be overthrown than the law of nature that water runs down hill.

There was, indeed, a time in this country when railway competition was deemed essential to a town or city's prosperity. Those were the days when railways made rates to suit themselves, and built up this town and held that in check, as suited their pleasure and the interests of their managing officers. But the course of events has changed all that. The work of the state and interstate railway commissions with the legislation behind them has compelled the railways everywhere to make rates which shall not only be reasonable in themselves, but fair and equal as between individuals and communities. Under these circumstances, there is no more necessity for the multiplication of competing railways; in fact, to do so is to lessen the prospect of lower rates, for if two roads are built and operated to do business which one is able to handle, the cost of moving a ton of freight or a passenger is greatly increased. Doubtless even Mr. Smalley will concede that in the long run railway rates can never be less than the actual cost of service.

The fifth meeting of the International Railway Congress, held in London in July, and a report of the technical proceedings of which is given in another column, was the most important meeting of this body which has ever been held. It was not only the first meeting of the Congress ever held in an English-speaking country, but was the first in which a prominent part has been taken by the railway managers of England, and its colonies, and also the first in which American railways were adequately represented. The papers or reports prepared for presentation at the meetings form a mass of valuable information on every phase of railway equipment and operation, and the discussions are equally valuable, but the practice of adopting certain conclusions as to each subject seems to be of little use, since the conditions and practice vary so widely in different parts of the world that it is almost impossible to formulate any definite conclusions of general application. That this is so is clearly shown by the vague and practically meaningless character of many of the conclusions adopted at this meeting. The most important effect of these meetings undoubtedly comes from the association of the members, their interchange of ideas in regard to opinions and practice, and the new ideas which the foreign members acquire in their visits to the railway and industrial works of the country in which the meeting is held. As to whether the results thus attained compensate for the travel and expense of these international assemblies, it is only necessary to remark that the delegates include not only subordinate officers, but men of importance and often of world-wide reputation, including presidents, managers, superintendents, chief engineers, superintendents of motive power and equipment, and other executive men of influence in large and small railway worlds. The decision, arrived at during this past meeting, to print the proceedings henceforward in English as well as in French will make the publications of very much wider influence, since comparatively few railway men of English-speaking countries are familiar with any other than their own language. Another important decision was that in contributions in English all dimensions, weights, etc., should be given in metric-decimal as well as in local figures. Two points which appear to call for some criticism are the excessive length of many of the papers, and the fact that the meetings are held practically behind closed doors, only delegates being admitted (with few exceptions), or allowed the privilege of joining in the discussions. On the whole, the meeting was an entire success, both in regard to its official and unofficial proceedings, and it is to be hoped that this success will be repeated and that the American element will be still more in evidence at the next meeting, which is to be held in 1900

The struggle now going on at Buffalo over the award of a contract for a 30,000,000-gallon pumping engine involves the whole question of the advisability of throwing municipal work open to the broadest possible competition. The Board of Public Works of that city recommended that the Council

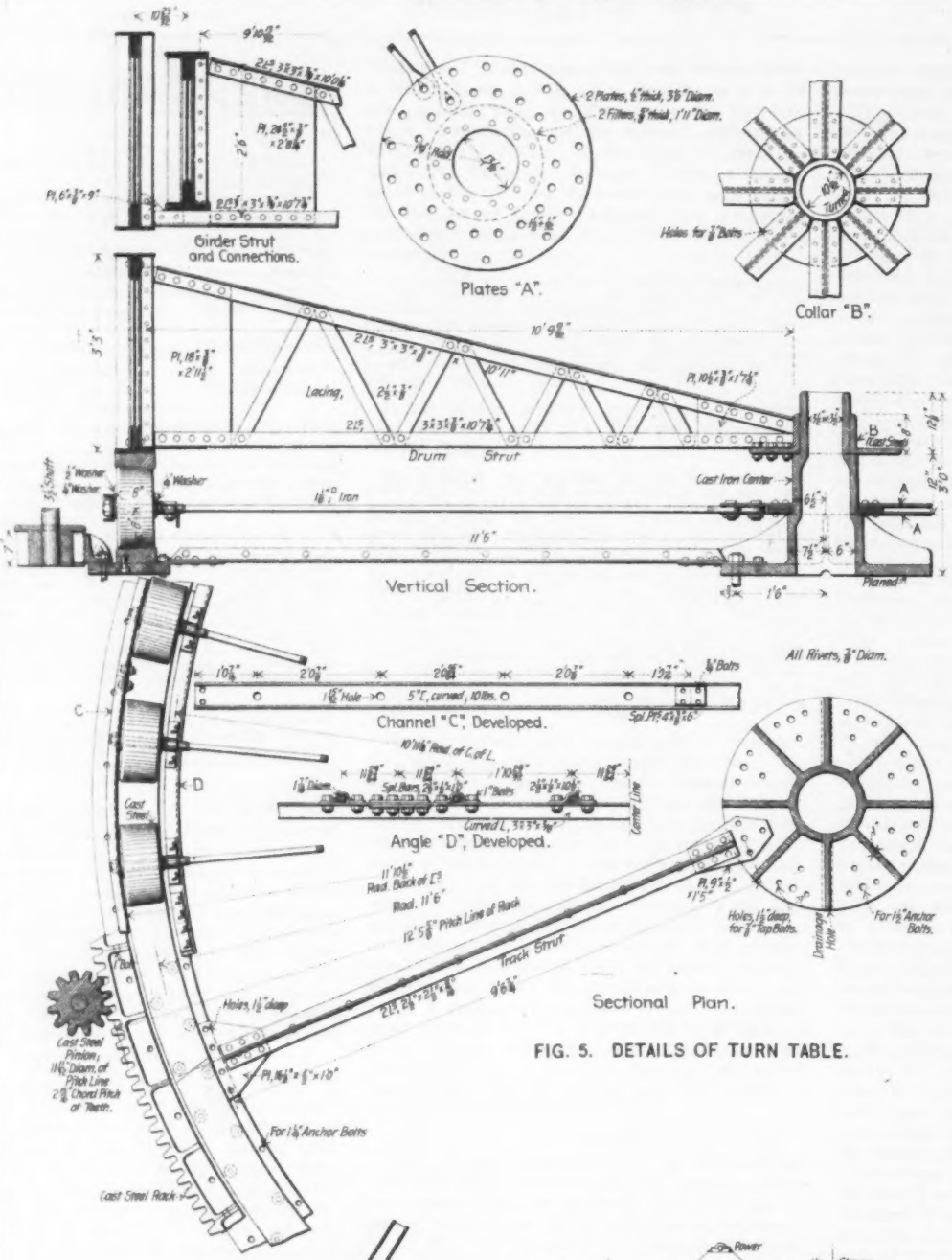


FIG. 5. DETAILS OF TURN TABLE.

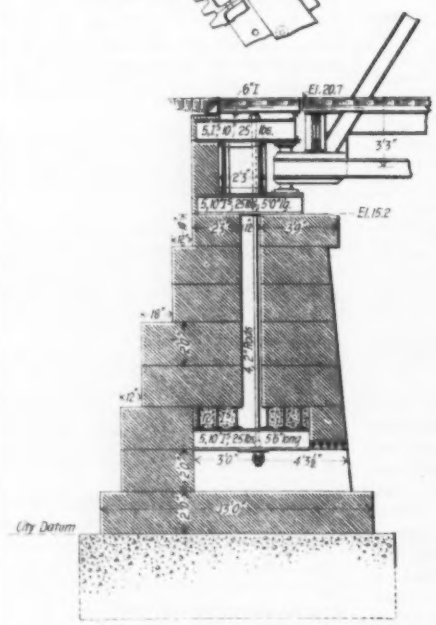


FIG. 9. SECTION OF ABUTMENT SHOWING CONSTRUCTION OF ANCHORAGE.

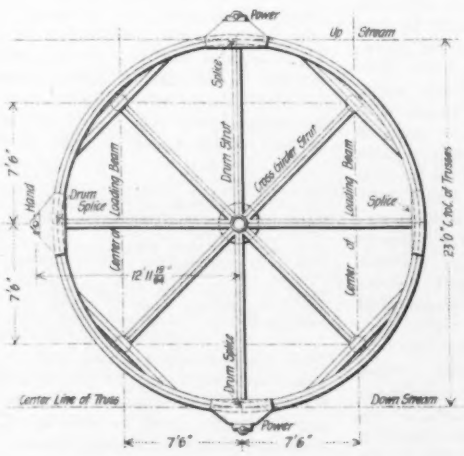


FIG. 3. DIAGRAM PLAN OF DRUM SHOWING METHOD OF CARRYING TRUSSES.

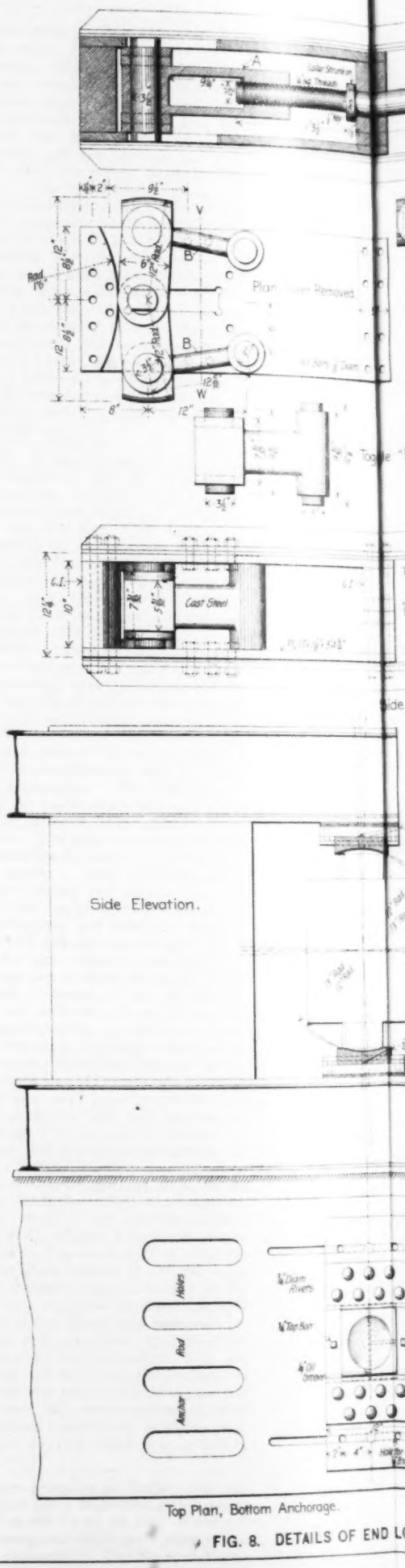
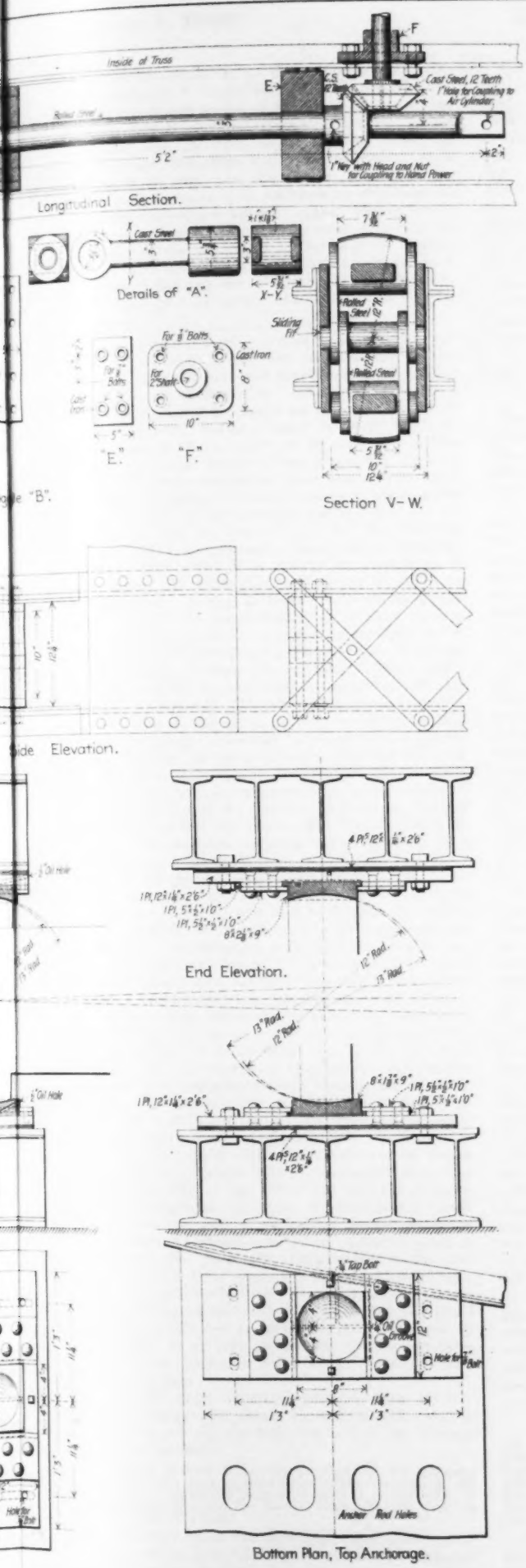


FIG. 8. DETAILS OF END L



S OF END LOCKING AND ANCHORING MACHINERY.

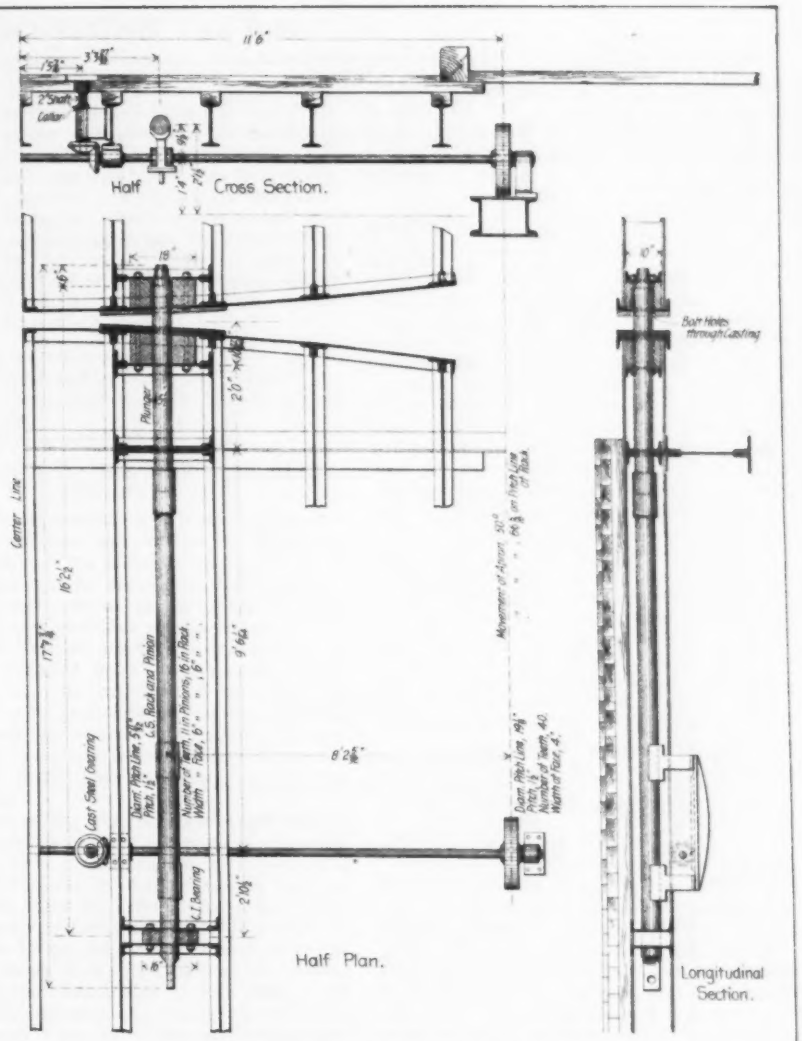


FIG. 7. DETAILS OF CENTER LOCKING DEVICE.

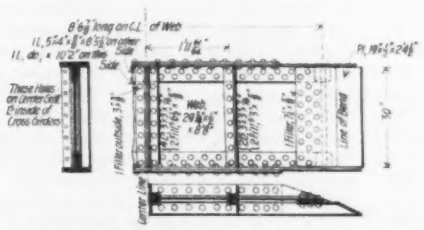


FIG. 4. DETAIL SHOWING CONNECTION OF CROSS GIRDER WITH WEB OF DRUM.

TURNING AND LOCKING MACHINERY FOR DOUBLE SWING BRIDGE, CLEVELAND, O.

Walter P. Rice, M. Am. Soc. C. E., Chief Engineer.

James T. Pardee, Assoc. M. Am. Soc. C. E., City Bridge Engineer.

Mt. Vernon Bridge Works, Mt. Vernon, O., Contractors.

CHAS. HART & SONS, LITH., 26 VESEY ST., N. Y.

award the contract to the Holly Manufacturing Co., of Lockport, N. Y., for $68,147. The council voted 7 to 2 to accept the bid of $74,500 submitted by the Lake Erie Engineering Works, of Buffalo, on the ground that the work should be kept inside the city, notwithstanding the increased price. It is evident to any one that if a city gets the reputation of awarding contracts on this basis all outside competition will soon cease. Mayor Jewett has very properly vetoed the award, following the opinion of the city's legal adviser that the contract must be given to the lowest bidder or not awarded. It is said that the veto will probably be over-ridden, in which case the matter will doubtless go into the courts.

The foolishness of proposing to secure bids and let contracts for a new city water supply without engineering advice is well illustrated by the present situation in Jersey City. The authorities there having neglected to employ an engineer, the Jersey City "Journal" finally engaged Mr. Wm. Kent, M. Am. Soc. M. E., to report on the three sets of bids outlined in our issues of July 4 and 11. This report is briefly abstracted elsewhere in this issue. While the report is designed merely to show which bid is the most advantageous for the city, two deductions may be drawn from it: (1) Allowing each bidder to practically frame his specifications elicits bids which it is difficult or impossible to compare. (2) Such specifications are likely to be inadequate. It may be asked, How can an award be made to the lowest bidder, as required by law, in the present case? For the Jersey City water supply one bidder offered a drainage area of 60 and two others of about 120 sq. miles. The relative quality of the material and workmanship will also vary in each bid. To take but a single instance: Only one of the three bidders, according to Mr. Kent's report, presented anything like a proper specification for the steel to go into the long and important supply main. One bidder offers to build a pipe line "strong enough to do the work required," and another says the pipe line "will not be strained beyond one-half the elastic limit," which point, as our correspondence columns testify of late, is a rather uncertain quantity.

One of the propositions submitted is far below the others, provided the city exercises the option to buy the works, but it is on a basis altogether different from the other bids, and while containing the best steel specification, it is indefinite or silent on many important points. If it is possible to cover these points in a contract, the city might secure good works under this bid, but the great question remains, Is the figure named, practically $6,000,000, the lowest one for which the city can secure 50,000,000 gallons of water daily, deliver 210 ft. above tide? To say that four requests for bids within some three years have never brought a lower offer does not answer the question, for it has been stoutly maintained that all the bids received heretofore have been enormously high. Is that true of all the present bids? Would the city do better by separating water rights from construction, thus securing what it has never had yet—full competition for material and labor? To what extent should the reservoir sites be stripped of organic matter (a point quietly passed over in the bids), in order to prevent the extremely disagreeable tastes and odors which arise where organic matter decomposes in newly-filled reservoirs? Is it more advantageous, considering expense, to build one or two pipe lines? An impartial and competent engineer, engaged by the city, is the only person who can answer these and other questions which should receive careful consideration.

In any event, when it comes to draw its contract, Jersey City would do well to steer clear of a provision like the following one in the Newark water contract:

> Copies of such plans and drawings of the different parts of the work as shall be prepared and used by the party of the second part shall be filed in the office of the Newark Aqueduct Board, from time to time, as the work progresses.

Under this clause the contractor could make few or many plans, as he saw fit; but whether he made few or many, he was not obliged to file them until the work was all completed, and then, or at any time, there was nothing that authorized the city to compel changes in work done, except outline specifications and an agreement to do good work.

The sudden death of Mr. E. F. C. Davis, President of the American Society of Mechanical Engineers, is surprising and sad news to his many friends throughout the engineering profession, and is a serious loss to the society in which he held the highest office. Mr. Davis is the third of the Presidents of the American Society of Mechanical Engineers to be removed by death, the others being the late Geo. H. Babcock and Eckley B. Coxe. A portrait and biography of Mr. Davis were published in our issue of Jan. 31 last, following his election to the Presidency of the Society.

Through an unexpected delay in making an engraving, the article on the "St. Louis," which is announced on our front cover page, has to be postponed to our next issue.

THE OUTLOOK IN THE IRON AND STEEL TRADES.

The business community has long regarded the condition of the iron and steel trade as a reliable barometer of the financial and commercial situation in general. At the present time, therefore, when every good business man is keenly watching every sign which indicates whether the recent improvement in business marks the beginning of a long season of "good times" or is merely a temporary recovery, the condition of the iron and steel market is of great interest, not only to those who make, sell and use iron and steel and its products, but to every one whose prospect for profits or profitable employment is affected by the business situation.

The history of the iron and steel trade for the past three years has been one long story of productive capacity in excess of consumption, of prices which steadily melted away in the competition between selling agents eager for orders to keep mills from shutting down and buyers aware that the advantage was all on their side. The turn of the tide, which came in the first half of the current year, found purchasers and sellers alike with scanty supplies on hand, and the advance in prices which followed when immediate necessities taxed the capacity of the mills in operation, was surprising in its suddenness.

The natural result of this advance in price has been a large addition to productive capacity. Mills and furnaces which have been lying idle for from one to three years are being put in shape for an active campaign, and no careful student of the market can at all doubt that an increase in productive capacity can thus be secured ample to cover the demands which even exceptional prosperity may bring. The capacity for production of pig iron by existing furnaces is far beyond any probable requirements of consumers, so that there is no reason to fear any actual shortage of iron, such as took place in the fall of 1879, in the famous boom which succeeded the six years of depression from 1873 to 1879. Even were this not the case, the lesson learned at the time of the collapse of the boom, in 1880, that it is at any time possible to build 100 new furnaces in the United States in a single year, and to increase the production of existing furnaces by rapid driving, has probably not yet been forgotten, and should check any tendency to speculative buying of iron, such as took place in 1879, with disastrous results to those who did not unload early in 1880. The prices now quoted for iron and steel products are, it would appear, sufficiently high to cause a production great enough to meet all possible requirements. How great the recent advances have been may be seen from the following figures, taken from a table in the "Bulletin" of the Iron and Steel Association:

	Prices per gross ton. Mar. 1, '95.	Aug. 1, '95.
No. 1 anthracite pig, Phila.	$12.00	$14.00
Grey Forge pig, lake ore, Pitts.	8.95	11.90
Bessemer pig, Pittsburg	10.15	14.40
Steel rails, Pittsburg	22.00	24.00
Steel billets at mill, Pittsburg	15.00	21.50
Best refined bar iron "	24.64	33.60
Wire nails, carload lots, Chicago	1.05	2.20

The latest market reports indicate that a check has taken place in the rapid advances, and that while there is an excellent prospect for an increased output and free sales at present prices, there is no fear of a repetition of the boom of 1879. On this the iron trade, as well as the country at large, is to be congratulated.

Some interesting figures of the prices of iron ore in 1893 and 1894 are given in a report just issued by the Division of Mining Statistics of the U. S. Geological Survey. The comparative prices are as follows:

	Prices per ton. 1893.	1894.
Average U. S.	$1.66	$1.14
Michigan	1.84	1.32
Minnesota	1.55	.73
Wisconsin	1.33	.93
Alabama	.86	.83

The greatest reduction is in Wisconsin, due to the cheap mining on the Mesaba range. The very low prices of iron ore in 1894 were undoubtedly due to the great depression in the pig iron market and the increased competition for sale of ore to the furnaces, caused by the development of the Mesaba range, and it is not probable that these low prices will be seen again for many years. The development of the Mesaba range, however, continues with apparently inexhaustible stores of ore in sight, and the competition of the several districts in Minnesota, Wisconsin and Michigan will tend to keep prices from rising above moderate figures.

The actual cost of mining the soft surface ores of the Mesaba range seems incredibly low to those who have not seen the methods in actual use in that region for mining the soft ore. Mr. Chas. Kirchhoff, M. Inst. M. E., Editor of the "Iron Age," is now visiting that region, and in the last issue of that journal he places the cost of mining Mesaba ores at the following figures:

Ores Mined by Steam Shovels.

Cost of stripping, per ton	$0.07
" " mining, " "	.08
" " royalty, " "	.25
" " freight to lower lake ports, per ton	1.70
Total	$2.10

For mines where the ore requires crushing, the cost of mining is put at 25 cts. a ton, and for underground mines on the best located and best managed properties 50 cts. per ton is the figure given, increasing the above total cost at lower Lake ports to $2.20 and $2.45 per ton, respectively. It is probably true, however, that these figures represent not only the lowest cost now reached at the most favorably situated mines, but lower figures than are likely to prevail in the future as the most easily-worked surface deposits become exhausted and the depth of the workings in the underground mines increases. Another fact of importance in connection with the future of this range is that the quality of its output has been considerably exaggerated. No small part of it is below the limit for working by the Bessemer process, and ore mined so far away from the furnaces which is below this limit must at present be sold at prices which leave no profit to the mine worker.

Of the older mining regions of the North Michigan peninsula, the Marquette, the Menominee and the Gogebic labor under the disadvantage of higher cost of mining, but with the off-setting advantages of shorter distance between mines and furnaces, giving 60 cts. per ton less freight rate, and the fact that most of the mines in these regions are owned in fee, and hence have no royalties to pay. With the probable increase in cost of mining on the Mesaba, the tendency will be toward more nearly equal cost of production in the mines of this entire region.

Reference was made above to the fact that much of the Mesaba ore falls below the Bessemer limit. Mr. Kirchhoff's inquiries develop the fact that some of the ore producers of that region are looking forward to the possibility of a scarcity of Bessemer ore during the season of 1896, in the event of an enormous demand for steel in that year. It is probably true that the North Michigan peninsula contains low-phosphoric ore sufficient for all possible demands in unnumbered years to come. But the older mines of the peninsula are now so deep that mining expenses are heavy, and the work of development necessary to increase output to respond to increased demand is a work which requires considerable time; the phosphorus contents of the ore also are subject to more or less variation. These causes, therefore, may operate to bring about a Bessemer ore production from this region next season inadequate to meet the demand.

Should such an event occur, American steel makers might be led to turn again their attention to the introduction of the basic process. German experience has now fully proved the value and

adaptability of this process from every point of view, and no detail of it can longer be called experimental. Its extensive use in the United States is bound to occur whenever an end is reached to the present abundance and low price of Bessemer ore.

Perhaps the question of greatest interest to the working engineer in connection with the iron and steel markets is the question whether prices on finished products—rails, beams, shapes, etc.—are likely to rise permanently to a point which will make necessary a material revision of the basis on which he has been making estimates of the cost of projected works, so as to render some of these projects financially impracticable. That existing furnaces and rail mills are adequate to supply all possible demands for pig iron and steel rails, seems absolutely certain. That the production of structural material will be made to equal all requirements of the trade seems also a certainty. Doubtless the lowest notch to which prices dropped in 1894 was a point which was really inadequate to pay the entire cost of production in any but the best-managed and best-located works, and we cannot look for some years to come for permanent prices on so low a scale as was then reached. On the other hand, the past three years have forced steel makers to practice economies in production that were never before thought of, and have shown that profits can be made at selling prices which were undreamed of a decade ago. It seems altogether probable, therefore, that the old days of steel beams at 3 cts. per lb. and steel rails at $35 per ton are not to return, and that the engineer can count in the future on obtaining iron and steel at a price which will cover only the cost of production and a moderate manufacturer's profit.

LETTERS TO THE EDITOR

CHUTES FOR LOADING COAL.

Sir: In your issue of July 11, "Engineer" asks for information on loading coal from a trestle into a vessel by means of chutes. The simplest way I know of for handling large quantities of coal is to use hopper-bottom cars on a trestle standing 45 ft. high from high water to base of rail. Open hoppers or pockets are built in between the track rails, and iron chutes 26 ft. long are hinged thereto. These chutes are raised and lowered by double-geared hand winches, and when extended at angles of 35° from the horizontal, their outer ends stand 20 ft. above high water, and 13½ ft. beyond the face of the wharf. These dimensions are for large steamers, but could easily be modified for smaller vessels.

Wm. B. Mackenzie,
Asst. Engr. Intercolonial Ry.

Moncton, New Brunswick, July 24, 1895.

COST OF STREET LIGHTING WITH ARC LAMPS.

Sir: In your issue of July 11 "A. B. J.," of Chicago, mentions a 100-light municipal electric light plant where the lights cost less than $41 each per annum.

I would be glad if your correspondent would get the details making up this low cost and publish them, or personally investigate the plant and see if the statement is correct.

During the past two years I have been called upon to investigate several municipal lighting stations where the published statements of cost of lights ranged from $29 to $60 per lamp per year, and invariably I have found the statements erroneous.

Recently I examined a plant owned by a city of 10,000 to 12,000 inhabitants, the chairman of whose light committee advertised that the lights cost only $36.50 each per year. Yet a careful review of the Council appropriations chargeable to light clearly showed the cost to be not less than $77, after deducting the revenue from commercial service.

I have generally found that the officials having direct charge of small municipal stations are not eager to publish the cost of their product, even if they know it, and therefore the council committee on light usually take the pay roll, cost of coal, carbons, and oil for one day, deduct revenue, if any, and call the remainder the cost of city lights for one day. Interest on the first cost of the plant and its depreciation are rarely considered, and the many incidental expenses due to breakdowns, accidents, etc., are lost sight of in the general accounts of a city government.

In your issue of March 23, 1893, you published a detailed statement of the operations of the Topeka, Kan., municipal light station, and that is one of the fullest accounts of a small station I have yet seen reported.

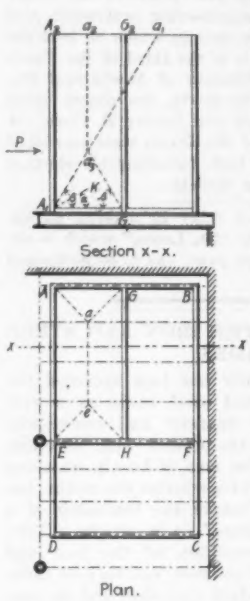
Naturally, I have become somewhat skeptical of published statements concerning the low cost of work done by small city light plants and would be glad to see them investigated by a competent engineer.

Very truly, R. Taylor Gleaves.

Lynchburg, Va., July 20, 1895.

DESIGN OF A MALT-BIN.

Sir: Having to design a malt-bin, I would ask if any of your readers knows of some reliable experiments made to find the co-efficient of friction of grain and malt? Also, is it common practice in figuring the pressure on bottom and sides of a tank containing grain to disregard friction and consider the grain as a liquid substance, or should the pressure be found like that of earth on retaining walls, introducing the angle of natural slope, etc.?



The figure shows a malt-bin, A, B, C, D, with partitions, E, F, and G, H. The supporting steel structure is indicated by dotted lines. In section X X angle α is the angle of natural slope, then half the angle K A_1 A_2 gives β, which becomes the maximum angle of repose, corresponding to $\frac{dP}{d\beta} = 0$, which gives P—the side pressure—its maximum value. Would it be safe to assume that the grain will divide itself into two portions, each pressing towards one side, so that the pressure on A E, for instance, would have to be figured for the frustum A a e E (A_1 A_2 a_2 a_1 in section) and not for the volume A_1 A_2 a_1, as one would do if the tank were filled with earth?

Yours respectfully, M. Ib. Nyeboe.

New York city, June 10, 1895.

(Doubtless some of our readers can furnish information concerning existing practice in building grain bins. As for the theory of the matter, we should suppose that it would be perfectly proper to consider the pressure like that of earth on a retaining wall, provided the angle of slope were known for the particular kind of grain to be stored and its condition. It may possibly be found that the coefficient of friction and the angle of slope are not constant, but depend upon the pressure. If so, this would further complicate the problem. In reply to the question, Would it be safe to assume that the grain will divide itself into two portions, each pressing toward one side? we would say that such an assumption is certainly not safe. To a certain extent, depending upon the angle of repose, the mass of grain acts like a liquid for any given height, pressing equally in all directions, and the pressure due to the height of a vertical column on the right-hand half of the bin is transmitted just as much to the left as it is to the right. If we consider the grain not as a liquid, but as a solid sliding mass, sliding, say, along the line A_1 a_1 the whole of the mass above this line must be considered, and not only that part that is to the left of the central line a_2 a_3.—Ed.)

THE ELASTIC LIMIT IN STEEL.

Sir: I am very much obliged to you for the complete review you have given in your issue of July 25 of the "elastic limit and the yield point," with full description of the methods used in 1879 and at the present time. I also hope that your request for further light on these subjects will bring out a full discussion from all sides.

The accompanying results of tests made on pieces cut from the same bar of steel (2 × ⅝ ins.), tested by seven different parties will be of interest, as they bring out several points which you have referred to. (These tests are taken from my discussion of Mr. H. H. Campbell's paper on "Specifications for Structural Steel" before the American Society of Civil Engineers, April, 1895. See "Transactions," p. 375.)

TABLE I.—Test Made by Riehle Bros., Philadelphia, of Mild Steel Specimen Cut from 2 × ⅝-in. Bar.

Load per sq. in.	Read'g of micrometer.	Stretch per 1,000 lbs.
25,000 lbs.	.0042 in.	.000168 in.
26,000 "	.0044 "	.0002 "
27,000 "	.0047 "	.0003 "
28,000 "	.0049 "	.0002 "
29,000 "	.0050 "	.0001 "
30,000 "	.0052 "	.0002 "
31,000 "	.0056 "	.0004 "
32,000 "	.0058 "	.0002 "
33,000 "	.0060 "	.0002 "
34,000 "	.0062 "	.0002 "
35,000 "	.0064 "	.0002 "
36,000 "	.0066 "	.0002 "
37,000 "	.0068 "	.0002 "
38,000 "	.1838 "	.1770 "
39,000 "	.2039 "	.0210 "
40,000 "	.2148 "	.0109 "
41,000 "	.2278 "	.0130 "
42,000 "	.2490 "	.0212 "
43,000 "	.2705 "	.0215 "
44,000 "	.2990 "	.0285 "

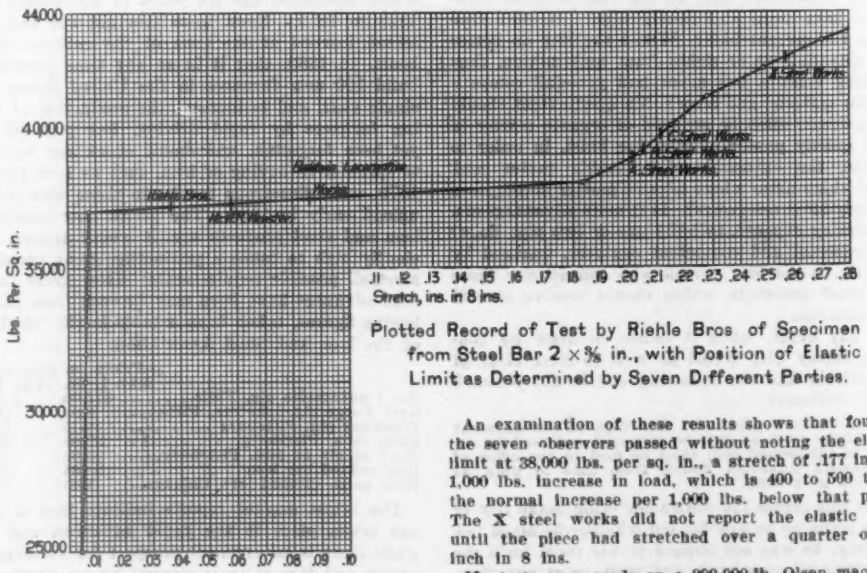
TABLE II.—Elastic Limit of Piece Cut from Same Bar as Test of Table I., as Determined by Seven Different Parties.

Material tested by.	Elastic limit, —lbs. per	Ultimate str'gth, sq. in.—	% elong. in 8 ins.	% of reduction of area.	% elas. limit is of ult. str'gth.
Riehle ..About	37,200	57,460	33.10	52.1	64.7
Webster	37,350	57,880	29.00	61.3	64.5
Baldwins	37,490	57,710	30.37	56.2	64.9
A steel works..	38,900	58,560	30.50	60.6	66.5
B " " ...	39,020	57,980	30.75	54.1	67.2
C " " ...	39,700	59,230	29.75	61.2	65.1
X " " ...	42,400	58,130	29.25	61.3	72.9

The analysis of this steel was as follows: C., .19; Mn., .44; P., .078; S., .025; Cu., .13; Si., .002.

The tests summarized in Table I. were made with a Riehle-Buzby extensometer. The readings represent actual extensions for each increase of 1,000 lbs. per sq. in. in the loading. The first load to about 24,000 lbs. per sq. in. was applied with a headfall of 1 in. in 64 seconds. From that point to beyond the limit, at 1-16 in. per minute, and then at 0.2 in. per minute, until the test piece showed a slight reduction at the breaking point. From that point to break, a headfall of 0.4 in. per minute was used. In a letter accompanying the above table, Messrs. Riehle Brothers state: "Please note that the elastic limits shown are for the first 1,000 lbs. per sq. in. above the limit. In the absence of any definite instructions on this point, we simply took the first reading showing disproportionate stretch; hence, all these quantities should be more or less minus. In the case of No. 10,027, the limit was probably about 37,200 lbs. per sq. in."

I also give herewith the diagram of these tests, using the elastic limits reported by each observer in connection with the corresponding stretch at these points, as given in Messrs. Riehle's report.



Plotted Record of Test by Riehle Bros of Specimen from Steel Bar 2 × ⅝ in., with Position of Elastic Limit as Determined by Seven Different Parties.

An examination of these results shows that four of the seven observers passed without noting the elastic limit at 38,000 lbs. per sq. in., a stretch of .177 in. for 1,000 lbs. increase in load, which is 400 to 500 times the normal increase per 1,000 lbs. below that point. The X steel works did not report the elastic limit until the piece had stretched over a quarter of an inch in 8 ins.

My tests were made on a 200,000-lb. Olsen machine, using a small friction wheel giving a slow speed of 1 in. in 16 minutes for taking the elastic limit, the drop of the beam being checked by use of the dividers.

You can do about as good work in this way as with the hand wheel. All the modern machines have this slow frictional speed, but many do not use it, claiming that it is too slow. W. R. Webster.
411 Walnut St., Philadelphia, Pa., July 29, 1895.

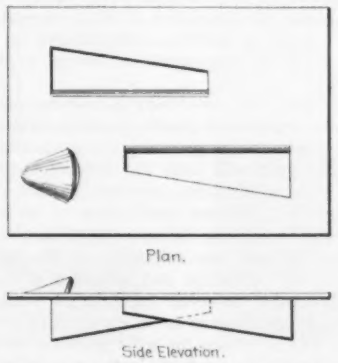
AN OCEAN-GOING HYDRAULIC DREDGE.

The work of improving the harbor at Galveston, Tex., to make it accessible to large warships and ocean steamers, includes the dredging of a deep-water ship channel across the bar, on which there is now a depth of 18 ft. of water. It was decided that this could best be done by suction dredges which could go to sea to discharge their loads, as described in the article on "The Handling of Dredged Material" in our issue of June 13, and after a careful investigation of the situation Major A. M. Miller, U. S. Engineer Corps, awarded in October last, to the Bucyrus Steam Shovel & Dredge Co., of South Milwaukee, Wis., the contract for an ocean-going hydraulic hopper dredge to carry out this work. This company sublet the contract for the hull of the vessel to Hugh Ramsay, shipbuilder, of Perth Amboy, N. J., to whom much credit is given for the success of the work, and the vessel was equipped and finished complete at the Ramsay shipyards. The dredging apparatus and engines were specially designed by Mr. A. W. Robinson, M. Am. Soc. C. E., Chief Engineer of the company, and were built at the company's works, while the propelling engines were built by the Neafie & Levy Ship & Engine Building Co., of Philadelphia, Pa., and the boilers by the Cleveland Ship Building Co., of Cleveland, O. On Aug. 3 the dredge made its first trip from the shipyard, going down the bay for a trial of the engines and pumps, and then outside Sandy Hook to discharge its load and to ascertain its sea-going qualities.

The vessel resembles a screw tug boat of exceptionally large size, having a low freeboard. It has a long deck house (carried above the deck level, so as to afford access to the hoppers), and carries two pole masts and one smokestack. It is 177 ft. long, 35 ft. beam and 16 ft. depth of hold, and has a displacement of about 1,650 tons at the load line. The draft is 12 ft. The hull is of wood, sheathed with copper, and is formed with two hoppers separated by a transverse bulkhead, the forward hopper extending up to the rear of the pilot house. Right aft of the after hopper are the pump-engine room, boiler room and propelling-engine room, respectively. Each hopper has six doors or valves in the bottom, these doors being operated by rods connected with vertical screws above the deck, each screw being revolved by a hand-wheel and bevel gear on a fixed nut. The mouth of the discharge pipe from each pump is at the after end of the rear hopper, and the stream of sand and water is carried to the forward hopper by wooden chutes or sluiceways. These chutes are fitted with stopboards, so that the stream may be distributed to keep the vessel in proper trim. The hoppers are open at top, the sides being carried up above the deck and pierced with openings for the escape of the overflow when the hoppers are full of water but the pumps are still working, the hoppers not having the full charge of sand which is in suspension in the water. The hoppers have a combined capacity of 500 to 575 cu. yds.

In the pump room are two centrifugal pumps, one at each side of the vessel, and each pump is driven direct by a vertical marine compound 125-HP. engine, with cylinders 12 × 14 and 22 × 14 ins. The cylinders are side by side, and the shafts are placed transversely or athwartships, of the hull. The suction pipe is 15 ins. and the discharge pipe 18 ins. diameter, and special care has been taken in the design of the pumps and the arrangement of the pipes to give a free and easy flow, and to avoid churning. These pumps and engines are intended to run at 250 revolutions per minute in regular work, and can load the hoppers in about two hours. The cylinders rest upon cast iron frames rising from the back of the bedplate, and turned iron rods, or standards, from the front of the bedplate. The height from center of shaft to center of cylinder is 6 ft. 2 in. The crank cheeks are counterweighted and there is ample provision for the lubrication of the journals and working parts. The suction of each pump is connected with a hinged flexible dredging or suction pipe outside of and parallel with the hull, this pipe being fitted with double flexible connections to give easy riding in a seaway, and having a drag or hood on the end. The end of the pipe is suspended from an iron frame by a wire cable and pulleys, the cable being attached to a loose chain fastened to the middle and end of the pipe. The raising and lowering of the pipe is done by a steam hoisting engine with two horizontal cylinders placed close against the bulwarks. In service the drag rests on the bottom and the vessel steams slowly ahead, pumping up a stream of sand or mud and water. A copper pipe from the suction end of the pump leads to a vacuum gage in the deck house, and a steam pipe is fitted for blowing through the pumps if it should become clogged. The pump disks have bolted arms and the casing can be removed to allow of repairs or renewals of the blades. It will be understood that the entire dredging plant is in duplicate, working on both sides of the vessel.

The four-bladed propelling screw is driven by a direct-acting marine two-crank compound engine of 500 HP., giving the vessel a speed of 7 knots per hour when loaded and 10 knots when empty. Steam for all purposes is provided by two single-end Scotch boilers, 10 ft. diameter and 11 ft. long, each having two Fox corrugated flue furnaces. The



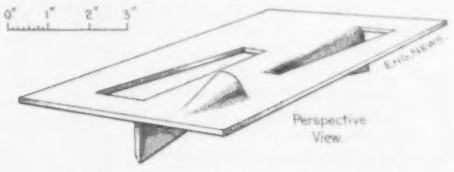
boiler pressure is 100 lbs. per sq. in., and the coal bunkers have a capacity of 90 tons. The vessel is fitted with the Chase steam steering gear, Providence steam windlass, two suction pipe hoists, two Huntington searchlights and arc and incandescent lights, the lighting plant consisting of a Ball high-speed engine (Ball Engine Co., Erie, Pa.) belted to a Westinghouse dynamo. The ship can be handled and all plant operated by a crew of 15 men, but there are accommodations for a much larger crew. It will proceed under its own steam to Galveston, and is required to undergo satisfactorily a service trial of 10 days. The material there met with is a clean and very fine sand, and the proportions of sand and water pumped cannot be determined until actual trials are made. The contract price of the dredge was $86,000.

On the trial trip the vessel, which is named the "Gen. C. D. Comstock," carried a large party of engineers and newspaper men, among those present being Major Miller and other army engineers, Mr. Ramsay, the builder, and Mr. Robinson and Mr. Eels, of the Bucyrus Co. The working proved entirely satisfactory, and it was specially noted that there was a marked absence of vibration in the hull, either from the pump or propelling engines, proving the easy running of the engines, and the stiff and substantial construction of the hull. The vessel also rode steadily at sea, but the motion was too much for the stomachs of a few members of the party.

HIGH-PRESSURE WATER SUPPLY FOR A UTAH MINING DISTRICT.

A water-power pumping plant, working under a head of about 475 ft., and against a head of 1,290 ft., will form a part of the water supply of the Mercur Mining Camp, in the Quirrh Mountains, Utah. The plant is being built by the Gold Hill Water Power Co. Water is brought to the wheel and pumped through a double-riveted steel pipe line from the forks of Ophir Creek. This line will include two 12-in. branches, each about 2,000 ft. long, then 2,000 ft. of 18-in. and 4,800 ft. of 15-in. pipe, leading down Ophir Canyon. There will be a 6-ft., single-nozzle Pelton wheel, and a Worthington duplex-power pump with four plungers 5½ ins. in diameter and 15-in. stroke. This will be geared 5 to 1, and at 26 revs. per min. will have a capacity of 150 gallons per minute. The minimum water supply will be 5 cu. ft. per sec. and the water will be taken directly from the discharge from the Pelton wheel, no sump being used.

The force main will be 5 ins. in diameter and 12,300 ft. long, reaching to the top of Ophir Divide at an elevation above sea level of about 7,800 ft., from which gravity lines will conduct the water to the several mines. The force main and 10 miles or so of supply and distributing pipe will be of screw-joint wrought iron. From the end of the force main the pipe will be 4 ins. in diameter for a long distance, falling nearly 1,000 ft. in 13,370 to the Mercur Divide, from which a branch 6,800 ft. in length will supply the Mercur town site and mills. About 6,600 ft. beyond the Mercur Divide the main line will reach the Sunshine Divide, which is 600 ft. higher than the Mercur. From this point the pipe will be 2½ ins. in diameter and will fall some 1,700 ft. in 6½ miles, passing through the Glencoe mines and ending at the Sunshine group of mines. Several small branches will be taken off at points along the line. Pipelaying was about



THE FOX PRESSED STEEL TIE PLATE.

ready to be started the middle of July and contracts had been let for the machinery. The rate charged the mills for water for leaching purposes is equivalent to about four mills per gallon, or 25 cts. per ton of ore treated. Capt. Thos. B. Rhodes, of Salt Lake City, is manager of the Gold Hill Water Power Co. We are indebted to Mr. W. P. Hardesty, C. E., of Salt Lake City, Utah, for the information from which the above account is prepared.

THE FOX PRESSED STEEL TIE-PLATE.

One of the latest metal tie-plates put on the market is the Fox plate, which, although comparatively new in this country, has been used to some extent in Canada for more than two years. The plate is of pressed or stamped steel, the stamping forming two triangular openings and bending the metal thus displaced so as to form two vertical ribs on the under side of the plate, these ribs running lengthwise of the tie. At the same time a shoulder or lug is pressed up on the upper side of the plate, against which the outer edge of the rail base bears. The spikes are driven in the outer ends of the openings. The plate from which the accompanying sketch is made is for a rail with a base 4½ ins. wide and measures 8 × 5⅜ ins., with a thickness of 5-32 in. The two flanges are 3⅞ ins. long, 1¼ ins. deep at the outer ends, and ⅝ in. at the inner ends. The deeper corners of these flanges are sharpened by the entrance of the cutting edge of the die, but otherwise the flanges are blunt, being the full thickness of the plate. It would seem as though a thicker plate would be required under any considerable traffic, especially as the cutting away of the metal near the ends makes the ends more liable to buckle, and the makers state that they are now furnishing one road with plates of three different thicknesses for a test to ascertain which thickness is most suitable. The plate is manufactured and sold by the Avery Stamping Co., of Cleveland, O.

Meters will be placed on all large consumers at Washington, D. C., hereafter, in accordance with a recent act of Congress. This act provides that after Aug. 1, 1895, the supply of water to all manufacturing establishments, hotels, livery stables and other places using large quantities of water, must be furnished by meter measurement, the meters to be supplied and set by the consumers after having been tested and approved by the authorities.

AN ENCLOSED AND WIND-BRACED STAND-PIPE, ST. CHARLES, MO.*

By Edw. Flad, M. Am. Soc. C. E., Consulting Engineer.

Stand-pipes are constructed in connection with water-works systems in order to relieve the pumps and pipe systems from excessive variations of pressure, or else to provide for storage of water.

If the object is merely to equalize the pressure, the stand-pipe need seldom be more than 5 or 6 ft. in diameter, even for the larger cities, and it should, if possible, be placed in close proximity to the pumping station. Where storage of water is desired, the stand-pipe will usually vary from 10 to 30 ft. in diameter, and it may be placed at any convenient location, proximity to the pumping station being of no particular advantage. In the smaller cities stand-pipes are usually constructed for storage purposes, generally with a view to storing sufficient water for the consumption during the night hours, permitting of the banking of fires under the boilers, and reducing the operating expenses.

The water tower at St. Charles, Mo., which is described herein, was constructed for storage purposes. The St. Charles water-works was built by a private corporation under the franchise plan in 1881, and was at that time provided with an elevated tank located on the site of the present water tower, about 1½ miles from the pumping station. The tank was of wood, 20 ft. in diameter and 16 ft. high, and was supported upon a brick substructure, 20 ft. square and 40 ft. high. After having served its purpose for a period of about eight years, the structure collapsed, and from that time until the completion of the present tower, the works have been operated on the direct pressure system.

It is generally supposed that the failure was

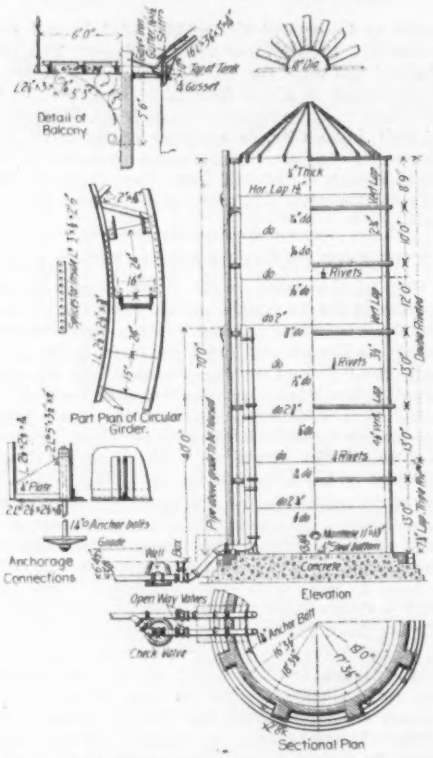


Fig. 1. Plan, Elevation and Details of Enclosed and Wind Braced Stand-Pipe at St. Charles, Mo. Edw. Flad, St. Louis, Mo., Consulting Engineer.

due to the poor quality of the brick used in the substructure, and to their gradual disintegration, owing to the action of frost upon the brick when saturated with water, which leaked or overflowed from the stand-pipe.

When the writer was intrusted with the design of a new storage tank, he had in mind a number of failures of similar structures, and determined to benefit as far as possible from the lesson taught by such failures. Out of 25 failures of stand-pipes referred to by Prof. Wm. D. Pence in his articles in the Engineering News (during the past 18 months.—Ed.), nine were presumably due, at least in part, to the formation of ice, six being total failures; and six accidents were due to the effects of wind pressure, one of these being a total failure.

A study of the failures which have been recorded leads to the conclusion that where no serious apparent fault in the design had occurred, when judged by the practice of leading engineers, the failures have been due to one or more of the following causes: (1) Inferior material; (2) formation of ice; (3) lack of proper provision against wind pressure.

If proper attention is given to these three causes of failure, there would seem to be no reason for doubting the ability of the engineer to design a stand-pipe which would be as safe as an elevated tank or any other engineering structure.

(1) In order to secure proper material it is, of course, only necessary to specify distinctly the quality of material required, and then to insist upon a rigid and careful inspection, and full compliance with the specifications.

(2) Where the stand-pipe is subject to extremely cold weather, a casing of wood, brick or other suitable material will usually offer sufficient protection against the formation of large amounts of ice, but if necessary suitable arrangements for heating can readily be introduced in connection with the casing.

(3) It has been customary to assume that a few stiffening angles and proper anchorage are sufficient to provide for wind pressure, the assumption being that the tank will hold its circular shape. For tanks of large diameter, however, further provision against wind pressure would seem to be desirable, in view of the many failures which have occurred, in order to avoid the collapsing of the upper sections or the vibration and swaying of the shell, which is liable to occur during high winds, when the stand-pipe happens to be only partly filled with water. The provision for wind pressure adopted by the writer will be set forth in the description of the St. Charles water tower.

The illustrations, Figs. 1 to 4, show the design of the St. Charles water tower as constructed. The tank is 25 ft. in diameter and 70 ft. high, having a capacity of 250,000 gallons. It is encased in brickwork, a space of 2 ft. being left between the tank and the inside of the brick casing. The foundation is built entirely of Louisville cement concrete faced with coursed rubble masonry. The roof is of metal, and is covered with slate placed upon metal purlins.

The plates of the shell are of soft steel, having a tensile strength between 60,000 and 68,000 lbs., and an elongation of not less than 26% in 8 ins., and a reduction of area at fracture of not less than 50%. Specimens were bent double and pressed flat without sign of fracture. There are nine rings in the shell, four plates to the ring. The plates of the six lower rings are 8 ft. 2 ins. wide and approximately 20 ft. long. The sheets vary from ¼ in. thick at the top to ⅝ in. thick at the bottom section.

The special provision for wind pressure, which it is supposed is used here for the first time, consists in a number of circular girders placed at intervals on the outside of the tank and riveted to it. These girders are made up of angles and lattice bars, one angle being used next to the tank and two angles for the outer flange of the girder. The brick casing rests against these girders. Wind pressure on the casing is therefore transmitted to the stand-pipe through the girders, and these latter hold the metal shell in its circular form and enable it to successfully resist the stress due to wind pressure. The girders, therefore, serve the double purpose of bracing the shell and casing.

Stand-pipes should be designed to successfully resist wind pressure when empty. The first effect of the wind is a tendency to collapse the shell, destroying the circular shape of the stand-pipe, and the upper thinner sections are, of course, the least able to resist such action. If sufficient rigidity is provided to prevent the collapsing of the shell, the stand-pipe will act as a cantilever, the leeward side being in compression. Adding such compressive stress to the compression produced at any section by the weight of the metal above, we can readily calculate the total compression at the windward side.

There are no available data, however, which will enable us to determine how much compression is allowable upon a column 10 or 20 ft. in diameter and 50 or 150 ft. high, built of thin sheet metal. The thickness of the metal in the shell required to resist collapsing could be approximated by assuming a section contained between two horizontal planes a foot or more apart, and calculating the semi-circular strip on the windward side as an arch. Such calculations would show that the upper sections of our stand-pipes should be built with considerably thicker plates than have usually been customary.

By introducing horizontal circular girders at short intervals, we provide an economical method for preserving the circular shape of the tank and preventing the collapsing of the shell on the windward side, and at the same time we resolve the stand-pipe into a series of short columns, the compressive resistance of which, under the cantilever action, may be assumed to more closely approximate the crushing strength of the material. These circular girders on the stand-pipe hold a position similar to that occupied by the stiffeners on the web of a plate girder.

As the casing is braced laterally by the girders and metal shell, the brickwork is not required to be self-supporting, except so far as the dead load is concerned, and may therefore be made very light. The brickwork for the casing of the St. Charles stand-pipe was made only 13 ins. thick for the lower 40 ft. and 9 ins. thick for the upper 30 ft. The pilasters and arches were introduced merely for architectural effect.

An inclined ladder is provided between the metal shell and casing (as shown in the details, Fig. 1, and the view, Fig. 2), with a landing at each girder, so as to make access to the structure for inspection and repairs easy and safe.

There are two 12-in. water connections to the stand-pipe at the bottom, placed so as to be easily

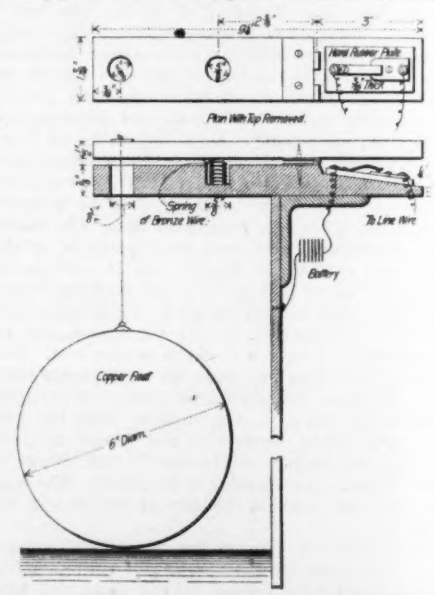


Fig. 4. Electric Alarm, St. Charles Water Tower.

accessible. They enter the stand-pipe at the side and are housed in for protection against frost. Both of these lead to the same water main. The connection through which the water enters the stand-pipe passes up into the stand-pipe, discharging at an elevation of 40 ft. above the base. The other connection terminates at the bottom of the stand-pipe, is provided with a check valve and serves as an outlet for the water when there is less than 40 ft. of water in the stand-pipe. With this form of connection the full capacity of the tank is utilized for storage, and still a sufficient pressure is insured for fire purposes whenever the pumps are operated.

A high-water alarm is provided (Fig. 4), consisting of a float which actuates a lever and makes an electric contact, ringing an alarm bell at the pumping station whenever the water reaches within 3

* A paper read June 5, 1895, before the Engineers' Club of St. Louis. A copy of this paper, with drawings and photographs, was sent to this Journal by Mr. Flad, with the request that it should not be published until it had appeared in the "Journal of the Association of Engineering Societies" for June, which has just been issued.

ft. of the top of the tank. A single wire is used, the current being returned through the water main.

In erecting the shell a light scaffold was built inside of the tank, and a cage swung on the outside, the plates being raised with the aid of a gin-pole. A forge was placed on the cage, and the rivets were driven from the inside.

After the bottom section was riveted together, it

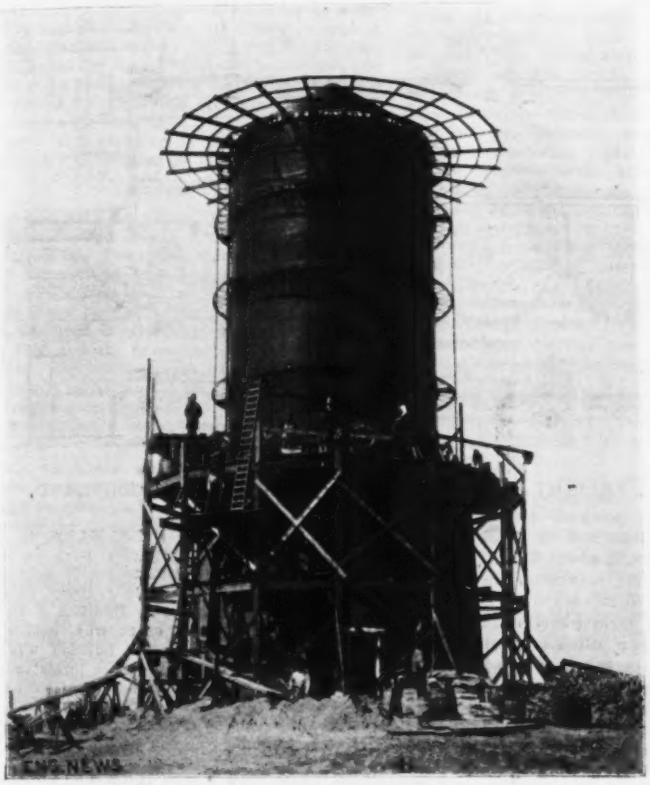


FIG. 2. VIEW OF WATER TOWER UNDER CONSTRUCTION, ST. CHARLES, MO.

FIG. 3. VIEW OF COMPLETED WATER TOWER, ST. CHARLES, MO.

was tested with water and made tight, and was then lowered upon the concrete bed, which had been previously leveled and smoothed with a trowel. Portland cement grouting was then introduced between the top of the foundation and the bottom of the tank, 17 holes 1¼ ins. in diameter having been provided in the bottom for this purpose. These holes were afterwards fitted with screw plugs. The sheets of the bottom were lap-riveted, and the rivet-heads were not countersunk. After the iron work was completed the brick casing was erected with the aid of exterior scaffolding, as shown by Fig. 3.

The foundation rests on good stiff clay, the maximum pressure on which, when the tank is full of water, is about 3,700 lbs. per sq. ft.

The Chicago Bridge & Iron Co. were contractors for the iron work, which was completed in March, 1895, water being admitted for the first time on March 23. The cost of the tower was as follows: Steel stand-pipe, including girders and iron work, $4,450; brick casing, $2,807; foundations, $678; total, $7,935.

NEW TYPES OF ENGLISH LOCOMOTIVES.

The distinctive type of locomotive for freight service on English railways is a six-wheel engine with all wheels coupled, and engines of this type form a considerable proportion of the rolling stock equipment. Engines with four driving wheels and a single pair of leading or trailing wheels are also used (Eng. News, April 16, 1892), and a few moguls and engines with eight wheels, all coupled, have been built for heavy freight service, but the "six-coupled" engine is the standard freight locomotive. The Highland Railway, of Scotland, in the early part of 1894, decided to add 15 heavy engines to its equipment, and for these Mr. D. Jones, the Locomotive Superintendent, adopted a type which in English parlance is styled a "six-coupled bogie goods engine," but which, in this country, is a freight engine of the ten-wheel type, having six driving wheels and a four-wheel leading truck. Outside cylinders are used, as on most of the engines of this road. These engines run between Perth and Inverness, 144 miles, on a single-track line with numerous grades of 1% to 1.43%, and curves 1320 to 1980 ft. radius. They can haul trains of 40 to 45 loaded cars (probably about 600 tons, taking 5-ton cars and 10-ton loads), or 12 cars more than the most powerful engines formerly in use, while one of them has a record of a speed of 60 miles an hour with a mail train on a down grade, taking 200-ft. curves easily and steadily. One of these engines has recently been illustrated by "The Engineer," from whose description we take the accompanying particulars.

The cylinders and boilers are unusually large, and a large firebox is provided, having a grate with a horizontal section or dead plate under the fire door, and thence sloping towards the front sheet. The smokebox is short, and the smoke-stack has a double shell with louvre openings in the outer shell, as described in our issue of Feb. 28, 1895, there being thus an annular chamber, which is closed at the bottom and open at top. The cylinders are outside, but have valve chests inside the frames, involving the use of long steam passages. The connecting and coupling rods are of rectangular section. The wheels are larger than is usual for freight engines in America, and the middle or main driving wheels have blind tires 5½ ins. wide. The distance between backs of all tires is 4 ft. 5½ ins., and the flanges are 1⅛ ins. high. The main and rear driving axles have underhung elliptic springs connected by equalizers, while the front driving axle has underhung helical springs, and the truck axles have unequalized elliptic springs over the boxes. The frames are 1¼-in. steel plates, 32 ft. 11 ins. long, and not less than 18 ins. deep, the plates being 4 ft. 1½ ins. apart. The truck frame is of 1-in. plates, 4 ft. 0¾ in. apart (inside the wheels), and the tender frames are of ⅞-in. plates. The engine is fitted with power brakes, and has a brakeshoe on each wheel, the brake power being equivalent to two tons per pound of air pressure. The general dimensions are given below, and may be compared with the American ten-wheel engines described in our issues of June 2, 1892, and May 25, 1893.

Ten-Wheel Freight Locomotive; Highland Ry.

Running Gear.—	
Driving wheels, diameter	5 ft. 3½ ins.
Truck " "	3 " 2½ "
Tender " "	3 " 9½ "
Journals, driving axles	8 × 7½ ins.
" coupled axles	7½ × 7½ "
" truck axles	6 × 8 "
" tender axles	5¾ × 9 "
Wheel Base.—	
Driving	13 ft. 3 ins.
Truck	6 " 6 "
Total engine	25 " 0 "
Center of truck pin to c. of leading driver	8 " 6 "
Driving wheels having blind tires	Middle or main
Weight in working order.—	
On drivers	94,080 lbs.
" truck wheels	31,360 "
Engine, total	125,440 "
Tender, "	80,640 "
Engine and tender, loaded	206,080 "
Cylinders (inclined 1 in 24)	20 × 26 ins.
Distance center to center	6 ft. 7 "
" " of cylinder to center of valve spindle	2 " 1¼ "
Piston rod, diameter	3½ "
Form of crosshead and guides	Two-bar guides
Connecting rod, length between centers	9 ft. 4 ins.
Valve Gear.—Type	Straight link
Ports, length	16 ins.
" width steam	1⅝ "
" " exhaust	3" "
Slide valves, lap	1" "
" " maximum travel	4¼ "
" " lead	3-16 "
Boiler.—Type	Straight top
Diameter of barrel (outside)	4 ft. 7⅛ ins.
Thickness of barrel plates	9-16 "
Thickness of smokebox tube plate	⅝ "
Height from rail to center line	7 ft. 4 "
Length of smokebox	3 " 1½ "
Working steam pressure	175 lbs.
Firebox.—Type	Copper
Length inside, bottom	7 ft. ½ in.
" " top	6 ft. 10½ ins.
Width " bottom	3 " 2⅛ "
" " top	3 " 5 "
Depth, average, firebars to crown	4 " 7½ "
Thickness of side plates	½ in.
" " crown sheet	½ "
" " tube sheet	⅝ and ½ "
Grate area	22.6 sq. ft.
Water space, width at bottom; front	3½ ins.
" " " " " back	3 "
" " " " " sides	2⅝ "

Tubes.—	
Material....Copper (steel ferrules at firebox end only)	
Number .....211; pitch (minimum), 2⅝ ins.	
Diameter outside .....2 "	
Thickness .....11 and 13 W. G.	
Length between tube plates.....14 ft. 5 ins.	
Heating Surface.—	
Tubes .....1,559.0 sq. ft.	
Firebox ..... 113.5 " "	
Total .....1,672.5 " "	
Miscellaneous.—	
Exhaust nozzle, diameter.....5 ins.	
Smokestack, inside diam. top.....1 ft. 4½ "	
" " " bottom.....1 " 3½ "	
" outside " .....1 " 7 "	
" height from rail to top.....13 " 0 "	
Capacity of tank.....3,600 U. S. gallons	
Capacity of coal space.....11,200 lbs	
Trac've force per lb. effec've press. on piston.165 "	

The Great Western Railway, of England, has up to the present time set its face against the introduction of the truck or "bogie" on locomotives, though it has for some years applied it to passenger cars. Many of the old broad gage (7 ft.) engines had four leading wheels, but they were carried by the main frame and not by a truck, and a favorite type of standard gage express engine had a single pair each of driving, leading and trailing wheels (Eng. News, Feb. 21, 1891). Recently, however, the company's works at Swindon have turned out two types of "bogie" engines from the designs of Mr. Wm. Dean, M. Inst. C. E., Locomotive Superintendent, both types being intended for fast passenger service, and being very handsome specimens of locomotive construction. One type is an ordinary American eight-wheel engine, with four coupled wheels and a leading truck. The other has a single pair of driving wheels, a pair of small trailing wheels and a leading truck. The trucks have plate frames outside the wheels and non-equalized plate springs over the boxes, which are outside the frames. The driving wheels have plate springs under the boxes, which are carried in the main plate frame outside the wheels. The claim has been made that the truck was not required on lines with such easy curves and good track, it not having been recognized that the truck adds to the ease of riding of engines on even the best track. The same reason has been given for the failure to adopt the equalizing system for the springs, which reason, however, is without force from a practical point of view, and it may be hoped that even the Great Western Ry. will eventually see the error of its ways in this respect. The general dimensions of the engines are as follows:

	"Armstrong," eight-wheel type.	"Achilles," single-driver type.
Driving wheels	7 ft. 0 ins.	7 ft. 8 ins.
Truck " (4).....	4 " 0 "	4 " 0 "
Tender " (6).....	4 " 0 "	4 " 0 "
Trailing "	.....	4 " 6 "
Wheel Base.—		
Driving	9 ft. 0 ins.	.....
Truck	7 " 0 "	7 ft. 0 ins.
" wheel to driver...	7 " 6 "	7 " 6 "
Driver to trailer.....	.....	9 " 0 "
Total, engine.....23 ft. 6 ins.		23 " 6 "
Trailer to tender.....	9 " 3¼ "	9 " ¼ in.
Tender .....15 " 0 "		15 " 0 ins.
Engine and tender.....47 " 9¼ "		47 " 6¾ "
L'gth over eng. & tender..57 " 10¾ "		57 " 7¾ "
Weight on main drivers.....	35,616 lbs.	40,320 lbs.
" " coupled drivers....	34,944 "	.....
" " trailing wheels....	.....	29,120 lbs.
" " t'ck (equally div'd).	43,232 lbs.	40,320 "
" total of engine.....113,792 "		109,760 "
" tender (nearly eq'ly div.)	72,800 "	72,800 "
" engine and tender.....186,592 "		182,560 "
Cylinders .....20 × 26 ins.		19 × 24 ins.
Steam ports .....14 × 2¼ "		14 × 2 "
Exhaust ports .....14 × 3½ "		14 × 3¼ "
Boiler.—		
Diam. of barrel.....4 ft. 3 ins.		4 ft. 3 ins.
Height from rail to c. line..7 " 4½ "		7 " 7¼ "
Working pressure .....160 lbs.		160 lbs.
Firebox, inside .....68 × 40 ins.		68 × 40 ins.
" outside .....76 × 48 "		76 × 48 "
" height .....6 ft. 2 "		6 ft. 2 "
Grate area .....20.8 sq. ft.		20.8 sq. ft.
Tubes, number, 266; diam.....1¾ ins.		1¾ ins.
" length .....11 ft. 9¼ "		11 ft. 9¼ "
Heating surface, tubes, sq. ft....	1,434.27	1,434.27
" " firebox, " "	127.06	127.06
" " total, " "	1,561.33	1,561.33
Tender tank, capacity, U.S. gals....3,600		3,600

These engines have raised fireboxes, the top being above the top of the boiler barrel, an arrangement formerly used as a substitute for a dome, but a dome is also used in this case. Short cylindrical smokestacks are used, with copper moldings on top. The smokebox is short, and is over the truck center. The main frames are outside the wheels, and the tops of the driving wheels are boxed in by splashers, upon which are brass plates with the name of the engine, this road being one of the few still retaining this interesting practice. The tenders are rather shallow, with bunker rails around the edges, and are carried on six wheels, with a rigid wheel base of 15 ft. The men stand upon a footplate a little higher than the axles and level with the tender deck, and are protected by a narrow cab. A good feature in the design is the shape and size of the steps on engines and tenders. The cars hauled include eight-wheeled "bogie" corridor cars of 21 to 24 tons, and other eight-wheeled "bogie" cars of 16½ to 23½ tons and 40 to 56 ft. long. Some of the trains weigh about 200 gross tons behind the tender, and the maximum speeds made on runs of from 42 to 75 miles are from 50 to 53 miles per hour. The eight-wheel engines, with 124 lbs. tractive effort per pound of average cylinder pressure, which may be taken at 100 lbs., have 12,400 lbs. tractive force, nearly one-sixth of the driving wheel load of 70,560 lbs. With a coal consumption of 31 lbs. per mile at a speed of 50 miles an hour, the engine would develop about 600 HP. The single driver engines have a tractive force of 9,400 lbs., or less than one-fourth of the driving wheel load.

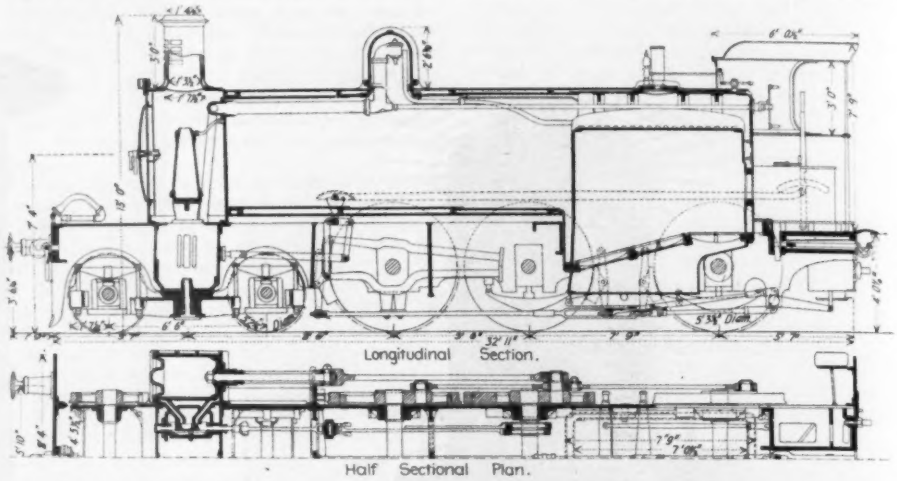


FIG. 1. TEN-WHEEL FREIGHT LOCOMOTIVE; HIGHLAND RAILWAY, SCOTLAND.

The Ohio State Canal, which extends from Portsmouth, on the Ohio River, to Cleveland, is desired by a private corporation, the Winifrede Coal and Coke Co., and it is said to be about to make an offer to the state for the canal. It is proposed to enlarge the canal to such size that it will carry boats 100 ft. long, 25 ft. beam, and from 7 to 10 ft. draft. These boats could be floated from the Kanawha mines to the Ohio River, and thence to the mouth of the canal at Portsmouth. From there to Cleveland, and from Cleveland to Chicago, Duluth, and points along the lakes, the boats would be towed by tugs. By this plan a continuous water route could be secured from the Kanawha Valley to the most remote lake points. It has been estimated by Kanawha coal men that the freight charges could by this means be reduced at least one-half, and with improved canal navigation, perhaps two-thirds. The proposition will be brought before the Ohio legislature at its next session.

The Massachusetts Ship Canal Co., lately organized to construct a canal across Cape Cod by way of the Bass River route, recently asked permission to issue $7,500,000 in stock, and the same amount in bonds. The petitioners stated that $8,946,000, half in stock and half in bonds, was required to build the canal, canal jetties, bridges, draws and to pay for land and damages. A further sum of $1,000,000, equally divided between stock and bonds, was needed for general equipment purposes, and $5,054,000, in equal shares again, was wanted for "general purposes of the company." This petition for authority to issue stock and bonds was signed by Benjamin J. Berry, as president of the new company, and by Bowdoin S. Parker, as counsel. The joint board of railway, harbor and land commissioners, to whom this petition was presented, hold the canal company to the terms imposed by the law of 1894, relative to the issue of stocks and bonds by railway and street railway companies. The act incorporating the new canal company provides that its issues shall be made in accordance with this law, which provides that it shall only issue stock and bonds from time to time in such amounts as are deemed by the Railway Commissioners reasonably adequate for the purposes of the company. The purpose of the law, as expressed by one of the commission, was "to put a stop to moonshine canal companies in Massachusetts." The joint commission authorized the issue of capital stock of the Massachusetts Ship Canal Co. to the amount of $500,000 only.

American iron ore is now being exported to Germany in small quantities, a curious result of the different development of the steel industry here and on the Continent. As is well known, the basic steel process has had a great development in Germany, whereas, in this country the accessibility of enormous quantities of low phosphorus ore, suitable for the acid process, has made the use of the basic process in this country largely unnecessary. In Germany, however, the demand for high phosphorous ores has so increased as to make it possible to import American ores of grades which are here almost unsalable. A contract has been made by Witherbee, Sherman & Co., of Port Henry, N. Y., for shipment of a large quantity of their magnetic ore to Germany, the requirement being that the ore shall carry a minimum of 60% of iron and not less than 0.90% of phosphorus. A premium is paid for an excess of phosphorus above that limit, the scale rising with each 0.1% of phosphorus. The ore now being exported averages over 1.7% phosphorus. The "Iron Age," from which we obtain the above information, states that the export of these ores is now specially

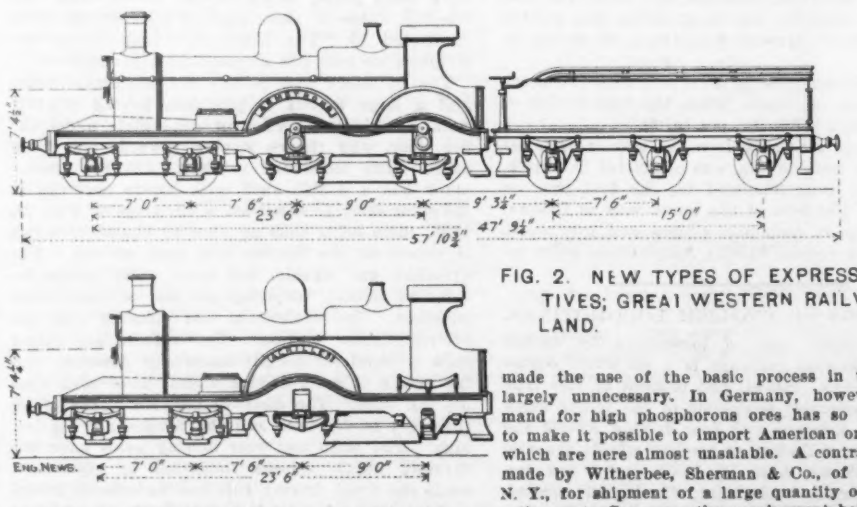


FIG. 2. NEW TYPES OF EXPRESS LOCOMOTIVES; GREAT WESTERN RAILWAY, ENGLAND.

favored by an exceptional scarcity of out-bound freight, and it is an open question whether the business can continue when a normal state of affairs exists in the freight market.

The extensive smelting plant of the Parratt Silver & Copper Co., of Butte, Mont., is to be moved to a point opposite Whitehall, on the Jefferson River, about 34 miles from Butte, and extensive refining and power plants are now being erected on the new site. For supplying power a conduit will be constructed from a point on the headwaters of the Jefferson River about 15 miles distant to the new plant, where it will furnish a head of about 100 ft. Turbines will be put in and electric generators will be run by them. The scheme includes the construction of an industrial town with power for manufactories, homes for employees, etc. The contract has recently been let for constructing a 318 × 86-ft. smelting house and a large calcining house. The ironwork for these structures was designed by Mr. Rudolph Schenck, of Chicago.

Smoke prevention by the method of washing the escaping gases is said to be in use in Glasgow and Greenwich, Great Britain. The smoke leaving the furnace is mixed with steam in an ascending flue, and then in a descending flue is met by a very fine spray of cold water. The larger part of the solid constituents of the smoke are dissolved or precipitated and escape with the water into a drain from the bottom of the descending flue. The water is used over and over again, and takes up not only the solid soot, which is extracted and used for lampblack manufacture, but various acid products, which have more or less commercial value.

No contract for a new water supply for Jersey City has yet been awarded, although bids were received over a month ago, as given in our issues of July 4 and 11. The city authorities having failed to seek competent engineering advice regarding the three bids submitted, the Jersey City "Journal" decided to employ an engineer to analyze the bids and give an opinion as to which one is the most advantageous to the city. Mr. William Kent, M. Am. Soc. M. E., was engaged for this purpose and his report was published in the "Journal" for Aug. 3, occupying nearly a page. Mr. Kent discusses the several bids in detail and concludes that the one submitted by the Rockaway & Hudson Water Co. is not only the cheapest in price, either for water by the million gallons or in case the city buys the works, but that its proposition conforms most nearly to the conditions under which a contract should be let. The specifications of the other bidders for the steel pipe line, which will form so important a part of any new supply, Mr. Kent considers as either indefinite or deficient in their requirements. A number of inconsistencies and undesirable features in the other bids are also pointed out. On the basis of two pipe lines, which Mr. Kent considers desirable, the average yearly cost, during a 25-year contract, of water by the million gallons, under the most favorable proposition made by the Rockaway & Hudson Co., would be $331,063, which is about $60,000 less than the next highest bids, under specifications which are considered inadequate. This is on the basis of a consumption of 25,000,000 gallons a day in 1898, when the works might be completed, increasing by 1,000,000 gallons a year to 49,000,000 gallons in 1922, the termination of the contract. Works furnishing a daily supply of 50,000,000 gallons built by the same company would cost the city, if bought, $5,943,000, against a probable $6,800,000 for the next highest bid, this bid having been made on a single pipe line basis, so that it is necessary to estimate the price this company would charge for works with two pipe lines. Under any of the various bids it is computed that the city would save money by buying the plant, rather than paying for water by the million gallons, the yearly saving ranging with the different propositions from $37,400 to $193,067. In closing, the report recommends that before accepting any bid an engineer experienced in dam construction should be consulted and that the option to purchase should not be exercised until the end of five years, in order that all questions regarding the capacity and stability of the works, and the questions of water rights involved, may be settled as far as possible. It is expected that the Street and Water Board will make an award on Aug. 13, after which action must be taken by both the Finance Board and the Mayor before the question will be settled.

THE INTERNATIONAL RAILWAY CONGRESS.

After the formal opening on June 26, as recorded in our issue of July 4, the next few days were devoted to various railway excursions throughout the United Kingdom, to visits to the locomotive and car works of the leading railways, and to visits to large steel works, factories, terminals, docks, etc., but these, as well as the social proceedings, were too numerous to be more than mentioned here.

The technical meetings were held in the Imperial Institute, London, commencing July 1 and ending July 9. The organization of the sections was as follows: Section No. 1: Permanent Way and Works; President, Mr. Richard Jeitteles, Emperor Ferdinand's Northern Ry., Austria; Secretary, Mr. Debray, Ministry of Commerce and Posts, France.—Section No. 2: Locomotives; President, Mr. Kossuth, Mediterranean Ry., Italy; Secretary, Mr. Sauvage, Western Ry., France.—Section No. 3: Traffic; President, Mr. S. Kerbedz, Vladi-Caucasus Ry., Russia; Secretary, Francois Schule, Ministry of Posts and Railways, Switzerland.—Section No. 4: General; President, Mr. Leon Say, Northern Ry., France; Secretary, Mr. Cornel Tolnay, Ministry of Commerce, Hungary.—Section No. 5: Light Railways; President, Sir Arthur Otway, London, Brighton & South Coast Ry., England; Vice-President, Mr. Gustav Behrens, Midland Ry., England; Secretary, Baron Albert de Fierlant, Florentine Tramways, Italy. The President of the Congress is Mr. Dubois, of the Belgian State Railways, and the Secretary is Mr. Weissenbruch, of the same railways. Sir Andrew Fairbairn was President of the English section, and Mr. W. M. Acworth, the well-known writer on railway affairs, was Secretary of that section, which was charged with the arrangement of the meetings and excursions, and general attendance to the comfort and convenience of the members and guests.

The closing meeting was held on July 9, addresses being made by the Chairman, Lord Stalbridge (London & Northwestern Ry.), and the President of the Permanent Commission of the Congress, Mr. Dubois (Belgian State Rys.). The next meeting of the Congress will be held at Paris in 1900, during the international exhibition.

The numerous papers presented were classified according to subjects, and were discussed by different sections of the Congress, each section meeting independently, so that several discussions were in progress at the same time. No abstracts of papers were read, as the papers had all been printed and distributed several weeks before, but after the discussion, in most cases, certain conclusions were formulated for presentation at a general meeting of the Congress, the conclusions being then further discussed and either adopted, amended or rejected. A defect which appears to have characterized a number of the papers was the failure to properly analyze and summarize the subjects treated, these papers presenting in some cases a mass of detailed information as to the practice of different roads, but not comparing the differences in practice, although, of course, the extremely varying conditions which obtain in different countries make this a somewhat difficult matter. We have prepared abstracts of some of the papers of most interest to engineers and railway men in this country, and give herewith a general statement of the subject matter of all the papers.

No. 1.—"Strengthening of Permanent Way in View of the Increased Speed of Trains." By Mr. Wm. Hunt, Chief Engineer of the Lancashire & Yorkshire Ry., England, and Mr. Ast, Chief Engineer of the Emperor Ferdinand's Northern Ry., Austria.—We shall give a brief abstract of Mr. Hunt's report, which deals with English-speaking countries, but only a brief abstract, for the reason that, like many of the reports, a large proportion is taken up by detailed descriptions of the practice of numerous individual railways. The main lines of English railways have for many years been increasing the weight of rails, and the weight and bearing area of the chairs, and there are no indications of further strengthening of the track, but Mr. Hunt considers that for speeds of 100 miles per hour attention should be paid to the balancing of the locomotives. Mr. Ast's paper also pointed out that the greatest expense for maintenance is due to the disturbing effects of the locomotives, and he thought that in any proposed improvement of the track the improvement of the locomotive should also be taken into account. In the discussion it was considered that there should be not less than 8 ins. of ballast under wooden ties, that the ties for express tracks should be at least 8 ft. 2 ins. long and 9½ ins. wide, that improved fastenings should be provided for flange rails, and that, while no perfect form of rail joint has been arrived at, yet that with increased rigidity of track and efficient fastening of the rails to the ties, the destructive action at the rail joints is reduced. In regard to the fastening of double-head and T-rails to the ties, it was considered that it was best to use chairs, a conclusion which is by no means borne out by the wide experience with fast and heavy traffic on T-rails in this country.

No. 2.—"Places in Permanent Way Requiring Special Attention." By Mr. Sabouret, Engineer of Permanent Way, Paris & Orleans Ry., France.—This dealt with the means taken to avoid the necessity of express trains slowing down to prevent shocks at facing switches, junctions, track and road crossings, sharp curves, drawbridges, etc. It was pointed out that the slackening of speed at such points is not caused by insufficiency of the appliances with which they are provided. The system adopted on each line depends especially on the administrative regulations, on the customs of the working administration, and on the necessities of the traffic. Thus the Northern Ry. of France, while only using well-known arrangements, avoids slowing down at all permanent way fittings, including swing bridges, and the passage of stations on single track, even when an express train passes a slow train there; while on the Netherlands State Ry., whose road is as favorable as that of the Northern Ry. of France, whose permanent way is as strong, and whose safety appliances offer as much security, the law requires trains to slacken on curves with radii lower than 3,300 ft., on down grades steeper than 1 in 200, at grade-crossings, at swing bridges, at facing switches, and at obtuse crossings. Grades and exceptional curves, where they are run over without slackening, are not specially strengthened. Most railways allow express trains to pass at full speed over switches and other track appliances, grade crossings, stations on double track, etc., without any other regulations than are required for ordinary trains; while many roads allow them to pass through stations on single track without reducing speed, and some even allow them to pass over drawbridges without reducing speed. He considered the frogs and switches of English railways to ride much more easily than those of continental railways, owing partly to the use of the heavy bull-head rail, which makes a very stiff construction, and partly to the design of each particular frog, etc., being made to suit the special requirements of its location, many of the roads doing this work in their own shops.

In the discussion of this paper Mr. Michel, of the Paris, Lyons & Mediterranean Ry., said that while his company formerly limited the speed to 12½ miles per hour over facing switches, it had now raised it to 25 miles, and would probably still further increase it to 37½ miles. Mr. Wise, of the Belfast & Northern Counties Ry. (Ireland), thought the use of guard rails the only means of making sharp curves safe, and such rails are required by the Board of Trade on all curves of 660 ft. radius and under. As to trains running at full speed through stations, in Great Britain every train must keep to the left, while on the Continent fast trains are given the straight route. Mr. F. S. Curtis, Chief Engineer of the New York, New Haven & Hartford R. R., said that while the drawbridges on that road are all designed for full speed, yet the express trains generally reduce speed to 25 or 30 miles per hour. The approaches to these bridges have derailing switches to turn a train onto a spur track ending in a bank of earth or sand should the train pass the signal indicating that the bridge was open.

No. 3.—"Junctions." Mr. Zanotta, Division Engineer, Mediterranean Ry. (Italy).—This paper dealt with the best arrangement of switches, the best method of laying out junctions on express tracks, so as to avoid reducing speed, and also the best means of enabling the speed to be maintained while abandoning the superelevation on junction curves. It recommended a careful laying out of the frogs and symmetrical arrangement of the tracks, and the use of large ties and good ballast on a well-drained subgrade.

No. 4.—"Construction and Tests of Metal Bridges." By Mr. Edler von Leber, Principal Inspector of the Railway Control Department, Ministry of Commerce, Austria.—This was a very lengthy paper, and the conclusions presented were to the effect that the quantities of metal used in construction are extremely variable, apart from the conditions of height and span imposed by local conditions. Thus for bridges of the same span the amount of metal per foot of track sometimes varies 100%, according to the prescribed loads, the limits of internal working strain specified, the system of construction adopted, and particularly according to the personal equation of the engineer who prepares the plans. The general formulas frequently submitted on the basis of very logical considerations for the purpose of calculating beforehand the weight of a bridge, are only applicable for designs prepared for the same railway or by the same engineer. It is far preferable to prepare a statement of weights of a large number of bridges and to proceed by way of comparison, or by "trial and error." The tables prepared by the author might be of service for this purpose, but the most satisfactory comparison each engineer can make is that which is the outcome of his own designs. The specified rolling loads are of special importance for bridges of small span, in which actual loads are of greater moment than dead load and wind pressure. The contrary is the case for bridges of large span, for when the span reaches about 330 ft., and certainly when it exceeds 390 ft., the dead load and wind pressure play the most important part in the calculations of resistances, which often assume unexpected forms in the case of exceptional spans. In the 1,710-ft. spans of the Forth Bridge, the load

of two heavy coal trains does not exceed 5% of the dead weight.

In the discussion Sir Douglas Fox, of the Manchester, Sheffield & Lincolnshire Ry., said that in England the bridges have to be designed for the heaviest engines which would be run over them, the bridge being loaded with such engines for its entire length. Typical train loads were therefore not considered, but in the exceptional case of the Forth Bridge the Board of Trade relaxed its rule as to loading and allowed the typical train test. With heavy trains and high speeds, much attention must be paid to the cross-girders and rail bearers, and in his experience in India he had known of bridges of ample strength which, while complying with train load tests, did not comply with the requirements to meet the effects of the impact caused by fast trains, and there had been considerable trouble with the cross-girders and rail bearers of these bridges. Gen. Hutchinson, R. E., one of the Inspectors of the Board of Trade, said that the Board required bridges to take the heaviest engines liable to be used, and in some cases the use of such engines was forbidden on account of the bridges. Mr. F. E. Robertson, Chief Engineer of the East Indian Ry., considered that the initial and periodical test loads applied in most countries for iron bridges were no guarantee of safety and should be abandoned.

No. 5.—"Locomotive Boilers, Fireboxes and Tubes." By Mr. E. Sauvage, Assistant Locomotive Engineer, Eastern Ry., France.—Of this interesting paper a very full abstract will be given in our columns.

No. 6.—"Express Locomotives." By Mr. John A. F. Aspinall, Chief Mechanical Engineer, Lancashire & Yorkshire Ry.—An abstract of this paper also we shall publish shortly, omitting entirely, however, the detailed descriptions of numerous locomotives of different countries, as this was merely matter of compilation and of little general interest, although valuable matter to have on record in the publications of the Congress.

No. 7.—"Rolling Stock for Express Trains." By Mr. J. C. Park, Car Superintendent, London & Northwestern Ry., England.—The cars considered are of three types: 1, The American type, open from end to end, and having end doors and a middle gangway or aisle; 2, the English type, divided into compartments, each compartment having a door on either side of the car; 3, the corridor type, with separate compartments, having doors opening into a gangway or aisle along one side of the car. This type is found to a limited extent in the United States, in the compartment palace cars and boudoir cars, but it is becoming very general for express train service in Europe. Reference was made to the introduction of "bogie cars" (cars carried on trucks), dining and sleeping cars, steam heat and gas lighting in Europe. Even the long-despised though revenue-making third-class passengers are now furnished with dining accommodation. Steel axles and Mansell's solid wood-center wheels are used on most English lines. On the Indian railways steel paneling is sometimes used, and some of the cars are fitted with cooling apparatus. A somewhat singular error in regard to the curves of American railways is made by Mr. Park, who says that "on the American railways the general absence of sharp curves, small over-bridges and tunnels has allowed the designers of the carriages a much freer hand in laying down the dimensions as compared with British and most European railways. Consequently, we find that long, wide and lofty carriages have generally been adopted." As a matter of fact, of course, American railways have much sharper curves than most European railways, but the early adoption of the "bogie" truck enabled long cars to be used, the flexible wheelbase enabling them to pass much more easily round sharp curves than the short European cars with rigid wheelbase could pass round curves of much greater radius. In the discussion it was stated that while built-up wood-center wheels had been found so successful in the temperate and even climate of Great Britain, yet in Italy, Russia and the United States they had proved unsatisfactory.

No. 8.—"Electric Traction." By Mr. Auvert, Engineer of the Rolling Stock Department, Paris, Lyons & Mediterranean Ry., France.—This was a long paper on different systems of electric traction employed on street railways or tramways, but referring also to the Heilmann electric locomotive (or steam and electric combination locomotive), and to the use of electric traction on main lines of railway. As to the latter, he said that in most cases tramway lines were grouped in such a way that the distance between the extreme points of the system is not great, and as the traffic consists usually of one or two cars working independently, the lines are well adapted for being operated from a central station, while on steam railways the distances are greater, the trains heavier, speeds higher, and the arrangement not so well suited to working from a central station. For this latter kind of service electric locomotives must be employed, while in the former kind motor cars are usually employed. A branch line of the Paris, Lyons & Mediterranean Ry., which is operated by electricity, was described in our issue of May 16. The discussion on this paper turned largely on the Heilman locomotive and the employment of electric traction for main railways.

No. 9.—"Acceleration of Transport of Merchandise." By Mr. Lambert, General Manager of the Great Western Ry. (England).—This paper discussed the question of the influence of speed upon the expenses of hauling, and the utilization of rolling stock equipment, and also upon the amount of equipment, accommodation and plant required. On English railways the "commercial speed," or speed for the entire trip, averages 10 miles per hour for coal and heavy freight, 16 miles for ordinary freight, and 23 miles for perishable freight, such as fruit, flowers and vegetables, etc., while dressed meat trains are run from the cattle yards to London at an average of about 29 miles per hour, in some places attaining a speed of 50 miles per hour. Freight trains are usually limited to 45 cars, as with more than this it is difficult for the trainmen in the caboose or brake van to communicate with the engineman.

In the discussion Mr. Baudry, of the Paris, Lyons & Mediterranean Ry., said that formerly the freight trains were limited to 15½ miles per hour, but this has been increased to 22 miles. For this faster service new engines with eight driving wheels were built (Eng. News, June 13, 1895), replacing engines with six driving wheels. The length of journey is nearly 600 miles, and the same train loads of 500 to 600 tons are hauled, but fuel is saved by the more rapid service and by the fact that the trains do not now have to wait on side tracks to allow passenger trains to pass, while the round trip of 1,074 miles between Paris and Cette is now made in six or seven days instead of 15 days. Mr. Eddy, Railway Commissioner of New South Wales, said that ten-wheel locomotives are now used which can haul trains of 615, 700 and 750 tons up grades of 1.33, 1 and 0.66% at speeds of 12, 15 and 18 miles per hour, respectively. An engineer of the Belgian State Railways stated that the advantages of increasing the speed depended largely upon the requirements of the traffic and the distances run. Thus, the coal trains from the Charleroi district to Antwerp are run at night, and as long as they reach the docks by 7 or 8 a. m. there is no advantage in increasing the speed. The conclusions arrived at were that the acceleration of the transportation of freight is often desirable, and the increase in speed can in certain cases be obtained without increasing the expense of traction, provided that suitable locomotives are used, so as not to require the train loads to be reduced. This applies specially to through freight traffic on main lines, but the speed can rarely be increased on branch lines with heavy grades. It is very desirable that the time spent on side tracks and passing places, in station operations, and in loading and unloading, should be reduced as much as possible.

No. 10.—"Station Working." By Mr. Turner, General Manager of the Midland Ry. (England); and Mr. Richter, Assistant Superintendent of the St. Petersburg & Warsaw State Ry. (Russia).—An abstract of Mr. Turner's paper on freight terminals and yards was given in our issue of July 11. In the discussion Mr. Kerbedz, Engineer of the Vladicaucasus Ry., Russia, stated that at the Black Sea port of Novorossik, where 500,000 to 600,000 tons of wheat are unloaded, cleaned, stored and reshipped annually, power was supplied for a radius of 1½ miles by a central station with four 250-HP. dynamos. The conclusions presented recommended the use of locomotives and mechanical appliances for switching as far as possible, instead of horse or manual power, the construction of warehouses at yards to avoid holding cars for unloading, and the adoption of gravity switching, and also pointed out the advantages of the application of electric power for working cranes, capstans, elevators, switches and signals.

No. 11.—"Signals." By Mr. A. M. Thompson, Signal Superintendent, London & Northwestern Ry., and Mr. Motte, Engineer, Belgian State Railway.—We give elsewhere an abstract of Mr. Thompson's paper.

No. 12.—"Cartage and Delivery." By Mr. Twelvetrees, Chief Goods Manager, Great Northern Ry.—This paper dealt with the system of collecting and delivering freight and parcels, and is of little interest in this country, where the railways never undertake freight delivery save when a zealous traffic manager wishes to cut rates.

No. 13.—"Organization." By Mr. F. Harrison, General Manager, London & Northwestern Ry.; and Mr. Duca, General Manager, Roumanian State Rys.—The paper by Mr. Harrison dealt with the different systems of the organization of the central administration and out-door staff on railways in various countries.

No. 14.—"Settlement of Disputes." By Mr. De Perl, Chief of the Foreign Traffic Department, Russian Railway Union.—This paper presented the various rules regarding the interchange of freight between the railways of different countries, and the rules for settling disputes between railways over matters connected with freight traffic.

No. 15.—"The 24-Hour Day." By Messrs. Secchi and Rocca, Chief Inspector and Inspector, Mediterranean Ry. (Italy).—This paper took up the question of the use of the 24-hour notation in railway time-tables and the division of the hour into 100 parts, and also discussed the partial adoption of the system in various countries, the advantages to the public, and the alterations of existing clocks and watches. The 24-hour system is in use on 5,300 miles of railway in Canada, on the railway system of British India, and in all the affairs of public life in Italy. In the United States and the British colonies it is favorably considered, but not yet adopted. This matter has been thoroughly presented in the reports of the American Society of Civil Engineers' committee on "Uniform Standard Time." The decimal subdivision of the hour is considered by the writers of the above paper as a matter for astronomers only at the present time.

No. 16.—"The Decimal System." By Mr. Wilkinson, Chief Goods Manager, Great Western Ry. (England). This paper discussed the questions of the introduction of the decimal system of calculations and the metric system of weights and measures, in regard to railway service, and we gave an abstract of it in our issue of Aug. 1.

No. 17.—"Contributive Traffic"; A, Methods adopted by important railways to encourage the building or working of light feeder lines. By Mr. De Backer, General Manager, Belgian General Economic Railway Society. B, In the case of light railways, what relaxation can be made by the government in its normal requirements for construction and operation without risking the public safety? By Mr. P. W. Meik, Engineer, London (England).—These questions are of great interest in Europe, where railway promotion is more or less hampered by government requirements, and where light railways and tramways are important items in developing the traffic of districts tributary to or isolated from the main lines. Mr. De Backer's paper dealt mainly with the question of through rates over main and light railways. The second question was specially presented by request of the Board of Trade, England, on account of the great interest now being taken in the proposed introduction of light and economical railways to develop trade in the districts not directly served by the existing main lines. Of course, the gage question came up, and Mr. Meik considered that a narrow gage might be justified under certain conditions.

In the discussion Mr. H. S. Haines, President of the American Railway Association, referred to the enormous expense incurred in the United States in changing thousands of miles of broad and narrow gage to do away with the evils incident to break of gage. Light engines could be safely run on a track of 56-lb. T-rails, ballasted with earth, and the telegraph order system, without fixed signals, could be safely used on a line with two or three passenger trains each way daily. Sir Charles Tupper spoke to the same effect in regard to Canada, and Mr. E. M. G. Eddy gave particulars of the construction of light railways in New South Wales. Sir Douglas Fox said that uniformity of gage was a more important consideration than any actual width of gage, and pointed out the necessity of alterations in the English laws so as to permit of the construction of light railways at a cost of about $30,000 per mile.

No. 18.—"The Working of Light Railways by Leasing Companies." By Mr. De Burlet, General Manager, Belgian National Light Railway Society; and Mr. Colson, Professor of Political Economy and Chief of the Railway Department of the Ministry of Public Works (France).—The subjects considered were the systems of leasing light railways to operating companies, the terms of such leases, and the practical results. It indicated a tendency in France for local authorities to build the lines and then lease them, but this is not common in other countries.

No. 19.—"Light Railway Shops." By Mr. Terzi, Manager, Suzzara-Ferrara & Sermide Ry. (Italy).—This was a short paper, which merely pointed out the conditions affecting a decision as to whether the shops should be at the middle or at one end of a light railway, and no general rules were considered to be applicable.

No. 20.—"Brakes for Light Railways." By Mr. Plocq, Superintendent, General Light Railway Society (Belgium).—This paper merely presented the various replies received from 46 light railways of various classes in regard to an inquiry as to their brakes. It is generally considered that continuous brakes are required in lines having steep grades. The style of brake required depends very largely upon the character of the railway, the lines considered ranging from steam tramways to branch railways. Reference was made to the automatic application of the Westinghouse brake on a light railway in England as soon as the speed exceeds 8 miles per hour.

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PERSONALS.

Mr. Hancock, City Engineer of Los Angeles, Cal., has resigned his position.

Mr. Benjamin Thompson has been appointed Assistant Engineer of the Southern Ry.

Mr. Robert H. Henry, civil engineer, formerly of Pittsburg, Pa., died at Denver, Colo., Aug. 4.

Mr. Thomas Johnson has been appointed Superintendent of Water-Works at Canandaigua, N. Y.

Mr. A. J. Colgrove has been elected Superintendent of Water-Works at Flint, Mich., succeeding Mr. E. A. Botsford.

Mr. A. D. Ball has been appointed Assistant Engineer to the Board of Public Works of Newark, N. J., under Mr. Sherrerd.

Mr. Joel Hurt, President of the Consolidated Street Ry. Co., of Atlanta, Ga., has resigned his position, and will be succeeded by Mr. Woodruff.

Mr. Charles Dunlap, General Superintendent of the Chicago, Rock Island & Pacific R. R., died at Chicago, Ill., Aug. 4 at the age of 48.

Messrs. H. C. Westcott, H. J. Donaldson and W. W. Brown have been elected additional members of the Board of Water Commissioners at Ballston Spa, N. Y.

Mr. Harvey M. Geer has been appointed engineer to the Water Commissioners of Ballston Spa, N. Y., to investigate and report upon an increased water supply.

Mr. C. C. Martin, M. Am. Soc. C. E., Chief Engineer and Superintendent of the Brooklyn Bridge, has been elected Consulting Engineer to the new East River Bridge Commission.

Mr. Jerome A. Fillmore, General Superintendent of the Pacific System of the Southern Pacific R. R., has been appointed General Manager of the Pacific System, succeeding the late Mr. A. N. Towne.

Mr. Bjoern Edwards, of the firm of B. Edwards & Co., proprietors of the "American Contractor," died last week from injuries received in a fall from a building being erected for him at Chicago.

Mr. George W. Fithian, at one time a member of Congress, has been appointed to fill the vacancy on the Illinois Railroad and Warehouse Commission formed by the resignation of Mr. C. F. Lape.

Messrs. D. S. White, Jr., F. P. Cook and M. Kuehnle have been elected Water Commissioners of Atlantic City, N. J. The board has been organized with Mr. White as President and Mr. Cook as Secretary.

Mr. Wm. H. Brown, Chief Engineer of the Pennsylvania R. R., celebrated last week the 21st anniversary of his appointment to that position. He has been in the company's service for about 34 years.

Mr. Edmund Smith, at one time Treasurer of the Pennsylvania R. R. Co., died in New York on July 31 as the result of a stroke of apoplexy. Mr. Smith, whose home was in Philadelphia, was about 67 years of age.

Mr. S. A. Merriweather, of Springfield, Mo., has been appointed Chief Engineer of the St. Louis, Siloam Springs & Southern R. R., and is making surveys for the projected line from St. Louis, Mo., to Fort Smith, Ark.

Mr. W. Reese has resigned his position as Assistant Engineer on the Rochester Division of the Western New York & Pennsylvania R. R., to accept a similar position on the Buffalo Division of the Lehigh Valley R. R.

Mr. Geo. A. Harris has resigned his position as Superintendent of Track, Bridges and Buildings, and Assistant to the President of the Lehigh & Hudson River R. R., to accept that of Engineer of the Reading Iron Co., Reading, Pa.

Mr. Samuel M. Barton has been appointed Professor of Pure Mathematics at the University of the South, Sewanee, Tenn. He was formerly Professor of Mathematics and Civil Engineering at the Virginia Agricultural and Mechanical College.

Mr. Levi W. Morse has been appointed Superintendent of the Grafton & Upton R. R., with office at Grafton, Mass., succeeding Mr. F. W. Morse, resigned. Mr. Levi W. Morse was formerly Superintendent of the Milford & Hopedale Electric Ry.

Mr. Alexander Kearney, of Wilmington, Del., has been appointed Assistant Superintendent of Motive Power on the United Railroads of New Jersey Division of the Pennsylvania R. R., vice Mr. C. M. Mendenhall, appointed Superintendent of Motive Power on the Philadelphia, Wilmington & Baltimore R. R.

Col. Henry T. Douglas, M. Am. Soc. C. E., has resigned his position as City Commissioner of Baltimore, Md., to accept that of Chief Engineer of the Baltimore & Catonsville Construction Co., which will build a boulevard and an electric railway from Baltimore to Washington, a distance of 40 miles.

Mr. Frank B. Rae, Consulting Electrical Engineer, formerly of Detroit, Mich., has moved his office to 1109 Fort Dearborn Bldg., Chicago. He is the designer of the Rae street railway apparatus, and was Chief Engineer of the Detroit Electrical Works. He will make a specialty of the designing of dynamos, motors and special apparatus, and of the installing of electric railways and municipal and private lighting plants.

Mr. A. Sorge, Jr., M. Am. Soc. M. E., has resigned his position as Superintendent of Fraser & Chalmers, Chicago, to open an office as a consulting mechanical engineer, making a specialty of all matters pertaining to foundry equipment and management. Mr. Sorge graduated from Stevens' Institute in 1875, in the first class that graduated from the full four years' course of that institution.

Mr. J. Fred Temple, M. Am. Soc. C. E., Bridge and Office Engineer of the Choctaw, Oklahoma & Gulf R. R., was accidentally drowned at South McAlester, I. T., on July 21. He was an expert designer and bridge engineer, and served in that line on the Northern Pacific, the Norfolk & Western, the Atchison, Topeka & Santa Fe and the Choctaw, Oklahoma & Gulf railways. He leaves a wife and two children.

Mr. A. G. Pendleton, General Traffic Manager of the South Australian Government Railways, has been appointed Railway Commissioner of the colony, under a new law, which substitutes a single commissioner for a board of three commissioners. His salary will be $6,000 per year. He was born in Ireland in 1837, has had railway experience in India and England, and has been Traffic Manager of the South Australian Government Railways since 1876.

Mr. L. L. Buck, M. Am. Soc. C. E., of New York city, has been elected Chief Engineer of the new East River Bridge Commission, which commission is composed of representatives of the cities of New York and Brooklyn. It is stated that the salary paid will be $10,000 per year. Among Mr. Buck's important bridge works have been the Verrugas Viaduct in Peru, and the substitution of iron piers for the old masonry towers of the Niagara River suspension bridge. He is also the engineer for the new highway bridge at Niagara Falls.

Mr. E. F. C. Davis, President of the American Society of Mechanical Engineers, was killed by a fall from his horse in Central Park, New York city, Aug. 6. He was born at Chestertown, Md., in 1847, and after some years' practical experience in shop and drawing office work was Chief Draftsman for the Pottsville Iron Works and the Philadelphia & Reading Coal & Iron Co., of which latter company he became Mechanical Engineer in 1887. In 1890 he became General Manager of the Richmond Locomotive Works, of Richmond, Va., and about four months ago became General Manager of the C. W. Hunt Co., New York. He was one of the earliest members of the American Society of Mechanical Engineers, was a vice-president from 1891 to 1893, and was elected President in January, 1895. A biography and portrait of Mr. Davis were published in our issue of Jan. 31, 1895.

Mr. Richard Morris Hunt, the distinguished American architect, died suddenly of heart failure on July 31 at his residence at Newport, R. I. He was the son of the Hon. Jonathan Hunt, a one-time well-known member of Congress, and was born in Brattleboro, Vt., on Oct. 21, 1828. At the age of 15 he left the Boston Latin School and went to Europe to study drawing at Geneva; later he became a student at the Ecole des Beaux-Arts, in Paris, and a pupil of the famous architect Hector Lefuel. After completing his studies with honor he traveled extensively through Europe, Asia Minor and Egypt, and on returning to Paris he assisted his old teacher Lefuel in planning and constructing parts of the Louvre. Mr. Hunt then returned to America, and was first associated with the late Thomas U. Walter in preparing plans for the completion of the Capitol at Washington. Among his own chief architectural works are the following: The Lenox Library, Produce Exchange, the Vanderbilt mansions and the Tribune Building in New York; the Yorktown Monument and the pedestal of the Statue of Liberty, the Theological Library and Marquand Chapel at Princeton, and many houses in Newport, R. I. Mr. Hunt was one of the founders of the American Institute of Architects and a past President, a member of the Architectural League, Associate Member of the Academie des Beaux-Arts (the only American so honored), member of the Architects and Engineers' Society of Vienna, and of the French Society of Architects. In 1867 he was a member of the jury on fine arts at the Paris Exposition of 1867, and for his services was made a Knight of the Legion of Honor in 1882. He was on similar juries at the Centennial and the Columbian expositions, and he was the architect of the Administration Building at the latter exposition.

ENGINEERING SOCIETIES.

COMING TECHNICAL MEETINGS.

ENGINEERING ASSOCIATION OF THE SOUTH.
Aug. 8. Secy., H. D. Runn, Nashville, Tenn.

SOUTHERN AND SOUTHWESTERN RY. CLUB.
Aug. 15. At Atlanta, Ga. Secy., S. A. Charplot, Macon, Ga.

AMER. ASS'N FOR THE ADVANCEMENT OF SCIENCE.
Aug. 28 to Sept. 7. At Springfield, Mass. Secy., F. W. Putnam, Salem, Mass. Local Secy., Wm. A. Webster, Springfield, Mass.

SOCIETY FOR PROMOTION ENGINEERING EDUCATION.
Sept. 2, 3 and 4. At Springfield, Mass. Secy., J. B. Johnson, Washington University, St. Louis, Mo.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 11 to 13. At Burlington, Vt. Secy., John C. Whitney, Newton, Mass.

NATIONAL IRRIGATION CONGRESS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., Fred L. Ailes, Los Angeles, Cal.

AMERICAN SOCIETY OF IRRIGATION ENGINEERS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., John S. Titcomb, Denver, Colo.

NEW ENGLAND ROADMASTERS' ASSOCIATION.
Sept. 18, 19. At the Revere House, Boston, Mass. Secy., M. C. Hamilton, Hartford, Conn.

AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 8. At Atlanta, Ga. Secy., R. W. Raymond, New York, N. Y.

ROADMASTERS' ASSOCIATION OF AMERICA.
Oct. 8. At St. Louis, Mo. Secy., W. W. Sharpe, Waycross, Ga.

AMERICAN INT. ASSOC. OF RY. SUPTS. OF BRIDGES AND BUILDINGS.
Oct. 15. At New Orleans, La. Secy., S. F. Patterson, Boston & Maine R. R.; Concord, N. H.

AMERICAN STREET RAILWAY ASSOCIATION.
Oct. 15. At Montreal, Que. Pres., Joel Hurt, Atlanta, Ga.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Aug. 9.	Brick & granite paving,	Louisville, Ky.	Aug. 1
Aug. 9.	Public building,	Pittsburg, Pa.	Aug. 1
Aug. 9.	Electric lights,	Louisville, Ky.	Aug. 1
Aug. 9.	Electric light plant,	Windom, Minn.	Aug. 1
Aug. 9.	Cement sidewalks,	Rochester, N. Y.	Aug. 1
Aug. 9.	Pumping engines, etc.,	Pittsburg, Pa.	Aug. 8
Aug. 9.	Intake crib, etc.,	Pittsburg, Pa.	Aug. 8
Aug. 10.	Paving,	Springfield, Ill.	July 18
Aug. 10.	Brick hospital building,	Columbus, O.	July 25
Aug. 10.	Electric light plant,	Bardstown, Ky.	Aug. 1
Aug. 10.	Bridge,	Cincinnati, O.	Aug. 1
Aug. 10.	Iron highway bridges (3),	Stockton, Ill.	Aug. 8
Aug. 10.	Association bldg.,	Wheeling, W. Va.	Aug. 8
Aug. 10.	Pipe sewers,	Medford, Mass.	Aug. 8
Aug. 10.	Bridge,	Portage, Wis.	Aug. 8
Aug. 10.	Bridge (200 ft.),	Henrietta, N. C.	Aug. 8
Aug. 10.	Railway,	Tallassee, Ala.	Aug. 8
Aug. 11.	Repair'g asphalt pavements,	St. Louis.	Aug. 1
Aug. 12.	Build.ng addition,	Los Angeles, Cal.	June 27
Aug. 12.	Bridge,	Rock Island, Ill.	July 11
Aug. 12.	Electric wiring,	Dallas, Tex.	July 25
Aug. 12.	Plans, high school bldg.,	Providence.	July 25
Aug. 12.	Plans for school bldg.,	Toledo, O.	July 25
Aug. 12.	Laying water pipe, Advertised, Eng. News, July 25.	Knoxville, Ill.	July 25
Aug. 12.	Brick paving,	Michigan City, Ind.	Aug. 1
Aug. 12.	Boilers (4),	Buffalo, N. Y.	Aug. 1
Aug. 12.	Paving,	Camden, N. J.	Aug. 1
Aug. 12.	Improving bridge,	Jersey City, N. J.	Aug. 1
Aug. 12.	Office building,	Toronto, Ont.	Aug. 1
Aug. 12.	Asphalt paving,	Rochester, N. Y.	Aug. 8
Aug. 12.	Heating & ventilating,	Los Angeles.	Aug. 8
Aug. 12.	Heating & ventilating,	St. Louis, Mo.	Aug. 8
Aug. 12.	School building,	Chicago, Ill.	Aug. 8
Aug. 12.	Extending school building,	Providence.	Aug. 8
Aug. 12.	Steam fog whistles (22), Advertised, Eng. News, Aug. 8.	Detroit, Mich.	Aug. 8
Aug. 12.	Trestle bridge,	Denver, Colo.	Aug. 8
Aug. 12.	Paving,	Chicago, Ill.	Aug. 8
Aug. 13.	Brick sewer, Advertised, Eng. News, July 18 and 25.	Indianapolis, Ind.	July 18
Aug. 13.	Jail,	Houston, Tex.	July 18
Aug. 13.	Asphalt paving,	Indianapolis, Ind.	July 25
Aug. 13.	Public building, Advertised, Eng. News, July 25 and Aug. 1.	Chester, Pa.	July 25
Aug. 13.	Paving,	Columbus, O.	Aug. 1
Aug. 13.	Paving, Advertised, Eng. News, Aug. 1 and 8.	North Tonawanda, N. Y.	Aug. 1
Aug. 13.	Dredging, Advertised, Eng. News, Aug. 1 and 8.	New Bedford, Mass.	Aug. 1
Aug. 13.	Laying 6-in. water pipe,	Harrisburg.	Aug. 8
Aug. 13.	Supplies for	Norfolk navy yard.	Aug. 8
Aug. 13.	Supplies for	Washington navy yard.	Aug. 8
Aug. 13.	Bridge,	Stanton, Neb.	Aug. 8
Aug. 13.	Repairing pier,	New York, N. Y.	Aug. 8
Aug. 14.	Asphalt paving,	Hoboken, N. J.	July 25
Aug. 14.	School building,	Baltimore, Md.	Aug. 1
Aug. 14.	Addition to museum bldg.,	New York.	Aug. 1
Aug. 14.	Completing armory building,	New York.	Aug. 8

Aug. 15. Brick paving, Pontiac, Ill.....July 18
Advertised, Eng. News, July 18 and 25.
Aug. 15. Water bonds ($200,000), Cleveland, O..July 18
Aug. 15. Rebuilding pump. mach'ry, Cleveland..July 25
Aug. 15. Asphalt paving, Peoria, Ill.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Water-works system, Montpelier, O...Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Pumping engine, Owatonna, Minn.....Aug. 1
Aug. 15. Steel bridge, Winnipeg, Man. .....Aug. 1
Aug. 15. Public building, New London, Conn....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Fire alarm telegraph, Carbondale, Pa..Aug. 1
Aug. 15. Irrigation bonds, Walworth, Neb.....Aug. 1
Aug. 15. Water-wks. system, Lebanon, O.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Brick paving (8,000 sq. yds.), Seattle...Aug. 8
Aug. 15. Road in Hancock, Mass.....Aug. 8
Aug. 15. Electric light plant, Montpelier, O.....Aug. 8
Aug. 15. Bridge, Churchs Ferry, N. Dak.....Aug. 8
Aug. 15. Cement, Washington, D. C.....Aug. 8
Advertised, Eng. News, Aug. 8.
Aug. 15. Church building, Niagara Falls, N. Y..Aug. 8
Aug. 15. Asphalt paving, Schenectady, N. Y....Aug. 8
Aug. 15. Sewer bonds ($15,000), Rockville, Conn..Aug. 8
Aug. 15. Heating plant, etc., Normal, Ill.....Aug. 8
Aug. 15. Sewers, Brooklyn, N. Y.....Aug. 8
Aug. 15. Paving (61,000 sq. yds.), Newark, N. J...Aug. 8
Aug. 16. Plans for school building, Buffalo, N. Y.July 18
Aug. 16. Brick paving, Cincinnati, O.....July 25
Aug. 16. Electric light bonds, Mankato, Minn...Aug. 1
Aug. 16. Water bonds ($19,500), Garrett, Ind...Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 16. Water bonds, West Carrollton, O.....Aug. 1
Aug. 16. Portland cement (2,500 bbls.), Ottawa,..Aug. 8
Aug. 16. Street signs, Plainfield, N. J.....Aug. 8
Aug. 16. Steam road roller, Plainfield, N. J.....Aug. 8
Aug. 17. Asphalt paving, Indianapolis, Ind.....Aug. 8
Aug. 18. Repairing public building, Cleveland, O.Aug. 1
Aug. 19. Electric wiring, Toledo, O.....Aug. 1
Aug. 19. Brick pav'g (22,000 sq.yds.), Warren, O...Aug. 1
Aug. 19. Steam tug, New York, N. Y.....Aug. 1
Aug. 19. Brick paving, Auburn, N. Y.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 19. Court house work, New York, N. Y...Aug. 8
Aug. 19. Water imp'v't bonds, Youngstown, O...Aug. 8
Aug. 19. Water-works system, Osborn, O.....Aug. 8
Aug. 19. Water-works, Elizabethtown, Ky.....Aug. 8
Aug. 19. Electric light plant, Osborn, O.....Aug. 8
Aug. 19. Sewers, New York, N. Y.....Aug. 8
Aug. 19. Cribwork on Lachine Canal, Ottawa..Aug. 8
Aug. 19. University building, Cincinnati, O.....Aug. 8
Aug. 20. Capitol building, Olympia, Wash.....June 20
Aug. 20. Steel highway bridge, Warren, Pa.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Sewer system, Logan, O.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Paving bonds, Springfield, O.....Aug. 1
Aug. 20. Library building, Kansas City, Mo.....Aug. 1
Aug. 20. Bridge abutments, Lock Haven, Pa....Aug. 1
Aug. 20. Museum building, Brooklyn, N. Y.....Aug. 1
Aug. 20. Sewer, Mount Vernon, N. Y.....Aug. 1
Aug. 20. Cast iron pipe, Hoboken, N. J.....Aug. 1
Aug. 20. Water-works system, Flushing, Mich..Aug. 8
Aug. 20. School building, Detroit, Mich.....Aug. 8
Aug. 20. Electric light plant, Flushing, Mich...Aug. 8
Aug. 20. Cleaning reservoir, Waterbury, Conn..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 20. Macadamizing, Winnetka, Ill.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 20. Pipe sewer, Brazil, Ind.....Aug. 8
Aug. 21. Dredging in Indian River, Fla.....July 25
Advertised, Eng. News, July 25 to Aug. 15.
Aug. 21. Water-works system, Oelwein, Ia.....Aug. 8
Advertised, Eng. News, Aug. 8.
Aug. 22. Water-works system, Lancaster, Wis..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Electric lighting, St. Thomas, Ont.....Aug. 8
Aug. 22. Water-works at Sonyea, N. Y.....Aug. 8
Aug. 22. Water-works, St. Johnsville, N. Y.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Pipe sewers (27,000 ft.), Avon, N. Y..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 23. U. S. public building at Savannah, Ga.Aug. 8
Aug. 24. Water-works materials, Jasper, Ind....Aug. 8
Aug. 24. Plans school bldg., New Whatcom, W'n..Aug. 8
Aug. 26. Hospital buildings, Bangor, Me.....July 25
Aug. 26. Electric lighting, Collinwood, O.....Aug. 1
Aug. 27. Supplies for Mare Island navy yard...Aug. 8
Aug. 28. Water-works system, Sigourney, Ia...Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 29. Asylum building, Bolivar, Tenn.....Aug. 8
Aug. 30. Timber (60 sq. miles), Ottawa, Ont....July 11
Aug. 30. Plans for school bldg., Buffalo, N. Y..Aug. 1
Sept. 2. Electric light plant, Canton, Miss.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works system, Canton, Miss....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works franchise, Canton, Miss..July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Electric lighting, Hempstead, N. Y...Aug. 8
Advertised, Eng. News, Aug. 8.
Sept. 2. Water-works system, Millersburg, O..Aug. 8
Advertised, Eng. News, Aug. 8 to 22.
Sept. 2. Bridge, Olivet, S. Dak.....Aug. 8
Sept. 3. Prison labor to let, Michigan City, Ind.Aug. 1
Sept. 3. Levee work, Greenville, Miss.....Aug. 8
Sept. 5. State capitol plans, St. Paul, Minn....July 11
Sept. 6. Court house, South Bend, Ind.....July 25
Sept. 6. Removing shoals (4), Detroit, Mich...Aug. 8
Advertised, Eng. News, Aug. 8 to 29.
Sept. 10. Plans for city hall, Worcester, Mass...July 18
Sept. 10. Water-wks system, Grand Junction, Colo.Aug. 1
Advertised, Eng. News, July 18 to Aug. 8.
Sept. 14. Plans for library bldg., Madison, Wis..July 18
Sept. 18. Water-wks. franchise, Butte, Mont....July 11
Advertised, Eng. News, July 11 to Aug. 8.
Oct. 1. Plans for art building, Philadelphia, Pa..May 23
Advertised, Eng. News, May 23 to June 27.
Oct. 1. Composite gunboats, Washington, D. C.Aug. 1
Nov. 1. Plans school building, Pittsburg, Pa...Aug. 8
No date. Bridge, Port Gibson, Miss.....Aug. 8

RAILWAYS.

East of Chicago.

CHICAGO & KALAMAZOO TERMINAL.—This company has about 90 men at work on construction, and as soon as bonds have been floated, work will be pushed more rapidly on a system of terminal tracks at Kalamazoo, Mich. A number of factory sites along the route will be offered to manufacturers. Ch. Engr., F. C. Balch; Pres., H. M. Lane.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Surveys have been made for a branch line of this road from Rocky River to Lorain, O., to accommodate traffic from the Johnson steel rail mills.

DELAWARE, LACKAWANNA & WESTERN.—Press reports state that surveys are being made from near Havens Crossing, a few miles from Dansville, through Scottsburg and thence following the shore of Conesus Lake down the east side of the lake through Racamosa, the lands of Capt. Dan Wackley, passing just east of McPherson's Point to Lakeville, N. Y., where the surveyors are now at work. It is stated that the company expects to control the ice trade from Conesus Lake to Rochester. Ch. Engr., J. Archbald, Scranton, Pa.

LOGGING.—Wise Bros., of Portland, Pa., have bought from Payne, Cochran & Co., Williamsport, 30,000,000 ft. of standing timber on 1,600 acres six miles south of Penfield, according to press reports, and a railway will be built from the low grade railway into the timber, and the logs brought to the Blanchard mill at Winterburn.

MUNISING.—A press report from Seney, Mich., states that a new railway, to be known as the Munising Ry., in Alger county, in which Tim Nester is interested, is progressing rapidly. The line has been surveyed from Munising, on Lake Superior, toward the southwest, passing through the valley of the Anna River about one mile north of Munising station, crossing the Duluth, South Shore & Atlantic at Halliston, three miles west of Munising station, and on south and west until it reaches the Chicago & Northwestern at Small Lake, a point about midway between Negaunee and Escanaba. There are strong indications of the road being extended farther east from Munising until it intersects the Manistique railway at Grand Marias, Mich. Several hundred men are busy grading the road at Munising, and boats are landing horses, machinery and working utensils nearly every day. Arrangements are being made for another branch to run from Munising towards the southeast, to connect with a short logging road operated by the Delta Lumber Co., near Delta Junction on the Soo line. The entire line is about 75 miles long. Several mills for manufacturing the hardwood will be located at once along the line.

OTTAWA, ARNPRIOR & PARRY SOUND.—The grading on this road is completed to Georgian Bay, over 2,000 men being now employed on the construction, and 35 miles will be completed this summer. Next year there will be only 40 miles to be built between the eastern and western sections of the road to complete the line to Parry Sound. Ch. Engr., Geo. A. Mountain, Ottawa, Ont.

PHILADELPHIA, READING & NEW ENGLAND.—Surveys are being made for a new line between Tariffville, Conn., and Springfield, the right of way for which, it is stated, was purchased several years ago. Ch. Engr., C. H. Ewing, Hartford, Conn.

PORT JERVIS, MONTICELLO & NEW YORK.—It is reported probable that the construction will soon be commenced on the proposed extension from Summitville to Kingston, N. Y. Pres., C. D. Haines, Kiderhook, N. Y.

WHIPPANY RIVER.—Incorporated in New Jersey, Aug. 1, to construct a railway in Morris county, N. J.; capital stock, $25,000, with $20,600 paid in; incorporators, Geo. W. Downs, Madison, N. J.; Richard McEwan, J. L. McEwan, W. W. Cook and Robt. E. McEwan, Whippany, N. J.; John E. Melick and F. A. Melick, Springfield, Ill.; principal place of business, Morristown, N. J.

Southern.

ANDERSON COUNTY MINING & MFG. CO.—It is reported that this company proposes to build a railway 17 miles long in Tennessee, and that surveys have been completed from Donovan Gap to the Cumberland Mountain coal mines, 5 miles. Ch. Engr., W. A. Gage, Oliver, Tenn.

BOYLE & SUNFLOWER RIVER.—This company contemplates building an extension from Boyle, Miss., northwest to Rosedale, 16 miles, for which surveys are now being made. Ch. Engr., B. C. Johnson, Rosedale, Miss.; Gen. Man., C. E. Boyle, Memphis, Tenn.

ATLANTIC COAST LINE.—This system is making considerable improvements to its roadbed and other property in North Carolina, including the substitution of 70-lb. for 56-lb. rails on that part of its road extending from Fayetteville to Wilson, N. C.

CHESTATEE PYRITES CO.—A press report from Dahlonega, Ga., states that the Chestatee Pyrites Co., owning copper mines seven miles east of Dahlonega, is determined to build its railway either from Lula or Gainesville to the copper mines. Dahlonega is now raising the $20,000 required to extend the road from the mines to Dahlonega. The road is to be 30 miles long, costing $175,000 from Gainesville or Lula to the mines, and $75,000 from that point to Dahlonega. Among the incorporators are George W. Scott, C. M. Candler, N. P. Pratt, H. P. Farrow, of the Pyrites company; Frank W. Hall, W. P. Price, W. A. Charters and M. G. Boyd, of Dahlonega; A. G. Jennings, of Brooklyn, N. Y., and George J. Baldwin, of Savannah, Ga. Maj. C. M. Bolton, of Washington, D. C., formerly Ch. Engr. Southern Ry., is in charge of the surveying party.

GEORGIA & ALABAMA.—This is a reorganization of the Savannah, Americus & Montgomery. It is stated that $800,000 of the amount subscribed will probably be called in within a few weeks, and $700,000 additional set aside for extending the road into Savannah, if necessary, as noted in our issue of July 18. It is intended anyway to build from Meidrim to Savannah, 17 miles, and the rails have been purchased for this work, but if the 58 miles of the Savannah & Western between Lyons and Meidrim can be secured no new road will be built between those places. It is stated that a contract has been awarded for building a 11-mile cut-off between Richmond and Louvale, Ga., by which the distance between Savannah and Montgomery will be shortened by six miles. Pres., John S. Williams, Richmond, Va.; Gen. Man., Cecil Gabbett, Americus, Ga.; Secy., W. W. Mackall, Savannah, Ga.; Treas., J. Wilcox Brown, Baltimore, Md.

LA FAYETTE & OPELIKA.—John L. Cowan and others, of La Fayette, Ala., have had surveys made for a proposed dummy railway to Opelika. Such a road would parallel the Central R. R. of Georgia, and there is also talk of building the road from La Fayette to West Point, Ga., on the Western Ry. of Alabama and Atlantic & West Point. The line to West Point would be shorter, but through a more hilly country.

QUEEN ANNE.—The Peninsular Construction Co., of Baltimore, Md., noted in our last two issues, has appointed John S. Gibbs, W. M. Oler and Henry C. Matthews a committee to examine the bids and award the contract for the first section of this road, extending from Queenstown to Denton, 23 miles. The road will extend from Queenstown to Lewes, Del., 55 miles, with a short branch to Rehoboth Beach.

TALLASSEE & MONTGOMERY.—Bids are asked until Aug. 10 for building this railway from Tallassee, Ala., to Goodwyn's station, on the Western Ry. of Alabama. Address the Tallassee Falls Mfg. Co., Montgomery, Ala. W. G. Williamson, Ch. Engr.

TENSAW & MONROEVILLE.—Incorporated in Alabama to build a railway in Baldwin, Escambia and Monroe counties; capital stock, $40,000; incorporators, U. Blacksher, J. J. Sullivan, David Blacksher, J. F. McGowan, John McGowan, J. J. Gant and Clem Givin. Neither Tensaw nor Monroeville, Ala., has railway facilities.

Northwest.

BELMONT & NORTH PLATTE.—The incorporation of this company was noted last week. The Omaha, Neb., "World-Herald" states that the road will be 50 miles long, connecting with the Burlington & Missouri River, and will be in operation within 90 days. The project is backed by the Belmont Canal Co., of which McShane & Condon, of Omaha, are the chief projectors.

QUINNESEC LOGGING CO.—Wisconsin papers state that this company will build a four-mile addition to its railway. According to Francis Brown, the work of improvement will be started soon, as the road will go into operation about Sept. 1. This will give the company 20 miles of railway. It now has three engines, but will buy several more cars. The line is situated in Dickinson county, but the stockholders of the company are all said to be residents of Marinette, Wis.

ST. LOUIS, PERRY & CHICAGO.—J. M. Piper, Pres., 1507 Washington Ave., St. Louis, writes us that about all the preliminary work is completed. Surveys and right of way for 77 miles have just been finished (from Macomb, Ill., to Pearl), money secured for all the necessary details and securities placed, and construction will be commenced inside of 20 days. Propositions are now under consideration from construction companies. We expect to have the trains running on the first 30 miles of road by Jan. 1, 1896.

Southwest.

ARKANSAS CITY & WESTERN.—Incorporated in Arkansas to build a railway north from Arkansas City to a point on the Arkansas River opposite the terminus of the Stuttgart road, and south to Gaines' Landing, about 70 miles in all; capital stock, $1,050,000; incorporators, W. M. Lewis, of Boston, Mass.; J. M. Whitehill, J. W. Dickinson, Jas. Murphy and Howard Robb, of Arkansas City; Jas. M. Franciscus, Jr., of St. Louis, and J. S. Stacy, of Anamosa, Ia.

KENNETT & RECTOR.—Incorporated in Missouri, July 30, with a capital stock of $120,000, to build a standard gage steam railway from Kennett to Rector, about eight miles; incorporators, W. F. Shelton, T. E. Baldwin, D. B. Pankey, W. G. Bragg, and T. R. R. Ely, all of Kennett, Mo.

ST. LOUIS, SILOAM SPRINGS & SOUTHERN.—Surveys for this railway are being made by S. A. Merriweather, Ch. Engr., of Springfield, Mo. The incorporation of this company by ex-Governor W. M. Fishback and others was noted in our issue of June 27. The road will extend from Fort Smith to the Northern line of the state of Arkansas, about 145 miles.

Rocky Mt. & Pacific.

ALAMEDA & SAN JOAQUIN.—This company has filed amended articles of incorporation for its proposed railway from the coal mines near Mount Diablo to Stockton, Cal., 30 miles; capital stock, $500,000; Ch. Engr., Geo. A. Atherton, Stockton, Cal.

ASTORIA & COLUMBIA RIVER.—Astoria, Ore., has raised the large subsidy asked to insure the construction of this railway from Astoria to Goble, 60 miles, and A. B. Hammond, the promoter, has telegraphed Alfred Kinney, Mayor, Astoria, that the work will begin at once. It is expected to make connection with the Northern Pacific at Goble. Mr. Hammond has secured the Astoria & South Coast road running from Young's Bay down to Ocean Beach, and it is stated it will be extended to the Nehalem country. Efforts have been made for several years to secure the construction of a railway from Astoria to Goble, and subsidies have been raised several times for this purpose.

COLORADO, UTAH & WYOMING.—The incorporation of this company was noted last week. Later information states that the company proposes to construct a railway from Rawlins, Wyo., to Craig, Routt county, Colo., and thence via Yampa Valley to Ashley, Utah, and a line from Rawlins north to the Seminole Mountains and to the mouth of the Sweetwater River; directors, E. H. Saltiel, A. M. Ghost, R. W. Weitbrec, E. A. Clifford, of Denver; J. W. Harrison, St. Louis, and K. Mendell, New York. The capital stock of the railway company is $5,000,000, and of the Colorado, Utah & Wyoming Land Co., same incorporators, $3,000,000.

STREET AND ELECTRIC RAILWAYS.

FRANKLIN, N. H.—It is reported that a syndicate, with ex-Congressman Warren F. Daniels as its head, has been organized in Franklin to construct an electric railway in this city.

HAVERHILL, MASS.—The stockholders of the Haverhill, Georgetown & Danvers Electric Ry. Co. have appointed the following directors: W. W. Potter and H. B. Perkins, of Haverhill; E. E. Wood, of Bradford; Walter M. Brewster, of Georgetown, and Merrill B. Bailey, of Topsfield. It has been voted to issue $100,000 of capital stock, and to petition for locations at once. The road will be in operation as far as Georgetown by Oct. 15. It will follow the Salem highway to Danvers, where it will connect with the Lynn & Boston line.——Charles Corliss and others have petitioned the Lowell, Lawrence & Haverhill St. Ry. Co. to extend its electric road from Haverhill to Ayers and the New Hampshire state line.

AUBURN, N. Y.—The Auburn Inter-Urban Electric R. R. Co. was incorporated Aug. 5 to construct a road about 25 miles in length, the southern terminus of which will be at a point upon the island at the foot of Owasco Lake, the northern terminus at the northerly end of Jackson St., near the Lehigh Valley R. R. station in Weedsport, and the easterly terminus in Genesee St., in the village of Skaneateles. The road is to begin on North St., in Auburn, and run to the

termini mentioned. The capital stock is $250,000, and the principal office will be in Auburn. Directors, Edwin F. Vooris, Charles Dietz, N. P. Goodhue, Wilson H. Pickley, L. S. Ebright, of Akron, O.; John J. Smith, of Cincinnati, O.; George B. Turner, Samuel E. Bell and Henry V. S. Lord, of Auburn, N. Y.

BUFFALO, N. Y.—We are informed that Geo. M. & Charles V. Busch, of Buffalo, have been awarded the contract for constructing the Buffalo, Gardenville & Ebenezer Electric Ry., as advertised in Engineering News. The road is to be completed by Oct. 1. Engrs., Voorhees & Witmer, Chapin Block, Buffalo.

GREENBUSH, N. Y.—The Albany, Greenbush & Bath Ry. Co. has been incorporated to build an electric road; capital stock, $150,000; directors, John F. Reilly, of Greenbush; Chas. A. Bailey, of Bath-on-the-Hudson and Wm. E. Drislane, Edward J. McCaffrey, Michael F. Cantwell, and Edward J. Duggan, of Albany, and others are interested.——The Albany Ry. Co., Gen. Man. John W. McNamara; Ch. Engr., T. E. Murray and the Albany & Suburban Ry. Co., have petitioned for franchises for extending their electric railways through this place and Bath.

SYRACUSE, N. Y.—The council has granted the Syracuse & Oneida Lake Ry. Co. a franchise for its electric road to South Bay.

ALLEGHENY, PA.—The Highland Park Passenger Ry. Co. was incorporated Aug. 3 to build an electric road in Euclid Ave., Friendship Ave. and St. Clair St., Pittsburg; capital stock, $50,000, with $5,000 paid in; Pres., Wm. B. Rhodes, of Allegheny.

ALLENTOWN, PA.—The North Susquehanna Transit Co. was incorporated Aug. 3 to build an electric road between Danville, Bloomsburg and Espy, Pa., with branches to Riverside, Rupert and Catawissa; capital stock, $125,000, with $12,000 paid in; Pres., A. E. Whitney, of Allentown.

HOMESTEAD, PA.—It is reported that Erbeck Bros., of Homestead, have been awarded the contract for the construction of the extension of the Homestead & Highland St. Ry. from Homestead to Duquesne. The rails and ties have been distributed, and the track has been laid to Munhall. Three miles remain to be finished. The cars will be run into McKeesport from Duquesne on the White traction line.

PHILADELPHIA, PA.—The Moyamensing Ave. & Penrose Ferry Passenger Ry. Co. has been granted a franchise to build an electric railway on Otsego St., from Mifflin to Jackson; Jackson St., from Otsego to Moyamensing Ave., and out the avenue to the Penrose Ferry Bridge.——The Chestnut and Walnut St. branches of the Philadelphia Traction Co.have been granted permission to lay tracks on Chestnut St. between 45th and 56th Sts.

PITTSBURG, PA.—Later information states that the West Side Belt Line, noted last week under Railways, will be operated by electricity. The road will probably be about 12 miles in length. Pres., James D. Callery; W. J. Burns, A. L. Schultz, E. S. Reilly, John S. Scully and G. W. Crawford are interested.

TOWER CITY, PA.—It is reported that the Williams Valley St. Ry. Co. has awarded the contract for poles for its electric road between Tower City and Lykens to Capt. Richard Budd, and it is stated that the contract for the construction of the road will be awarded in a few days. The company has a capital stock of $100,000. Pres., Philip Portner, of Girardville; Secy. and Treas., Chas. H. Barbardt, of Girardville, Pa.

BALTIMORE, MD.—Press reports state as follows: David B. Evans & Co., who are constructing the Edmondson Ave. electric road from this city to Benzingers Lane, about a mile west of Catonsville, have been awarded the contract for building the branch of the Maryland & Columbia Railway Co.'s road from Benzingers Lane to Ellicott City, a distance of 2½ miles. Work will begin on the Ellicott City branch in about a month, or as soon as the road to Catonsville is completed. The Maryland & Columbia Ry. Co. will in a few days award contracts for the building of the road in sections to Washington. The construction of the Ellicott City branch is in charge of the Baltimore & Catonsville Construction Co. Pres., T. M. Lanahan; Vice-Pres., Bernard N. Baker; Gen. Man., W. K. Schoepf; Treas., Ernest McElroy; Secy., R. Stanley Carswell; Engr., Henry T. Douglas; Electrical Engr., S. W. Hough.

AKRON, O.—It is reported that a company has been incorporated and the right of way secured for an electric railway from Canton to Akron. The incorporators include William Hoover, of New Berlin; Lew Smith, of Greentown; Milo White, of Springfield; W. H. Nees, of Uniontown, and W. A. Lynch, of Canton.

CINCINNATI, O.—The Cincinnati Electric St. Ry. Co. has been organized to extend the Sycamore St. cable road on Walnut St. to Fifth and thence to Sycamore St. It is proposed to change a portion of the system to electricity, and an electric extension is also proposed from Avondale to Hamilton. It is reported that $1,000,000 in first mortgage bonds will be issued, $410,000 of which will be used for cancelling the present indebtedness and the remainder will be used for the proposed extensions, etc. David Sinton and Henry Martin are interested.

CHICAGO, ILL.—The Suburban Electric Co. has been granted a franchise by the town board of Cicero for an electric railway 12 miles in length, to connect Austin, La Grange, Grossdale, Cicero, and other suburban towns with this city; capital stock, $1,250,000. Pres., Geo. I. Talbot, of N. H. Cooper & Co.; Secy., Homer K. Galpin.——The Metropolitan Electric R. R. Co. has been granted a franchise by the town board of Cicero for a road 27 miles in length. This company has a capital stock of $5,000,000.——It is reported that the Chicago & North Pacific Ry. Co. has been granted permission by the town board of Cicero to equip its road with electricity.

EVANSTON, ILL.—The Evanston Electric St. Ry. Co. has been incorporated, with a capital stock of $200,000, by Andrew Crawford and others.

MILWAUKEE, WIS.—The Milwaukee General Ry. Co. has been incorporated to build an electric road from this city to Cudahy and South Milwaukee; capital stock, $1,000,000; incorporators, Lawrence McGann, of Chicago, Ill.; J. E. Boden, William Kurth, Peter J. Somers, C. H. Mueller and R. A. Wieber.

SHEBOYGAN, WIS.—The Sheboygan, St. Paul & Central R. R. Co. has been granted a franchise for an electric road on certain streets.

DENVER, COLO.—The Denver Consolidated Tramway Co. has decided to construct new city terminals upon its property in the heart of the city. A double loop is to be built upon this property known as block 74, bounded by 15th, Arapahoe, Lawrence and 14th Sts. The alley running through the center of the block is to be widened into a 66-ft. street, into which the cars will turn from 15th St. All transfer of passengers will be made here and a beautiful ornamental depot constructed for the passengers. The company is also preparing plans for two large store and office buildings to be constructed upon this property. Work on the new tract will commence at once. John A. Beeler, Consult. Engr.

SAN FRANCISCO, CAL.—The Bicycle Ry. Construction Co. was incorporated in Sacramento July 27, to build railways under what is known as the Boynton Bicycle system; capital stock, $300,000, with full amount paid in; incorporators, Samuel W. Buglee and Prentis Selby, of Oakland; Wm. H. H. Hart, of San Francisco; Edward Dexter, of San Diego, Cal., and James L. Wheat, of Chicago, Ill.——The Shore Line Bicycle Ry. Co. was incorporated July 31 to operate in San Francisco, Santa Clara and Santa Cruz counties; capital stock, $2,000,000, with $100,000 paid in; incorporators, J. W. McClurg, Thos. W. Nowlin, W. A. Kirkwood, and James E. Ball, of San Francisco, and Geo. P. Adams, of Los Angeles.

ELECTRIC LIGHT AND POWER.

WHITINSVILLE, MASS.—Whitin Bros. are reported as to put an electric light plant in the new mill at this place.

ALBANY, N. Y.—It is reported that bids are to be asked soon for lighting the streets with electricity. John T. Cook, Chn.; John F. Donigan and J. Wagner, Committee.

BAINBRIDGE, N. Y.—Frank Gould, of Oneonta, is interested in a projected electric light plant for this place, according to reports.

CATSKILL, N. Y.—It is stated that James G. Newbury is contemplating the erection of an electric light plant.

HEMPSTEAD, N. Y.—Bids are asked until Sept. 2 for lighting the village with electric lights, as stated in our advertising columns. Lott Van De Water, Jr., Clk.

PATERSON, N. J.—It is reported that the Edison Electric Light & Power Co. has awarded a contract to J. W. Ferguson for the erection of a new building, to cost about $500,000, on the raceway at Van Houten and Prospect Sts. The chimney stack is to be 230 ft. high.

RAHWAY, N. J.—A new electric light plant is to be established in this city, according to reports.

BURLINGTON, N. C.—The new cotton mills to be erected at this place and Haw River by the Messrs. Holt will be equipped with electric light plants.

CHARLOTTE, N. C.—A spinning mill, to be erected at this place by the Highland Park Mfg. Co. will include an electric light plant in its equipment.

WASHINGTON, N. C.—The town authorities have decided to put in an electric light plant and a telephone system. Address the mayor.

ABERDEEN, MISS.—James M. Acker, Mayor, writes us that the electric light plant will be in operation by Oct. 15. The plant is now in, but a number of new lights, etc., will be needed.

MONTPELIER, O.—Bids are asked until Aug. 15 for constructing an electric plant of 40 to 50 arc lights of 1,200 c. p. and about 700 incandescent lights capacity. D. Stauffer, Mayor.

EATON RAPIDS, MICH.—An election will be held Aug. 19 to vote on the question of issuing $8,000 in bonds for an electric light plant, and $27,000 for water works. J. B. Hender, Secy. Comrs.

FLUSHING, MICH.—Bids are asked until Aug. 20 for constructing an electric light plant. Engr., H. H. Humphrey, 66 East High St., Detroit; address W. H. J. Martin, Flushing.

OSBORN, O.—Bids are asked until Aug. 19, according to reports, for the construction of an electric light plant. O. B. Kauffman, Clk.

JOLIET, ILL.—The water committee is considering a proposition of Messrs. Johnson & Harrison to put in an electric plant in connection with the proposed waterworks, of 250 arc lights capacity to be completed by June 1, 1896.

ROCKFORD, ILL.—Press reports state as follows: At the next meeting of the council the board will probably authorize the purchase of river property of the Chick Milling Co. and the erection of an electric lighting plant, to be owned by the city, costing about $65,000. The city is now paying $17,000 a year for street lighting. With the new plant 350 arc lights of 2,000 c. p. each will be put in, and it is estimated that the cost of operating the plant by water power will be from $10,000 to $12,000 a year, effecting a saving of from $5,000 to $7,000 annually, and giving the streets four times the present light.

SPOKANE, WASH.—The Consumers' Light & Power Co. has been granted a 50-year franchise for furnishing electric light and power. Work on the plant will be begun at once. Simon Oppenheimer, Secy. Northwest Milling & Power Co., is interested.

LOS ANGELES, CAL.—E. E. Peck and others have been granted a 20-year franchise by the board of supervisors for lighting the roads of the county and city by electricity.

ST. THOMAS, ONT.—Bids are asked until Aug. 22 for lighting the streets with electricity. A. W. Campbell, Cy. Engr.: W. E. Idsardi, Mayor.

NEW COMPANIES.—United States Electric Belt Co., Chicago, Ill.: $10,000; J. H. Lee, Lute S. Alteer, M. J. Frost.

Delavan Light & Fuel Co., Delavan, Wis.; $16,000; J. V. Phoenix, W. H. Tyrell, E. P. Williams, A. H. Kendrick.

Amplified Electric Co., East St. Louis, Ill.: $1,000,000; Fred Uirich, Edwin J. Paule, John T. Dodwell, of Carondelet (South St. Louis), Mo.

Pine Plains Light Co., Pine Plains, Dutchess county, N. Y.; $10,000; John R. Thompson, Amenia, N. Y.; Frank Eno, Frederick Bostwick, Chas. S. Wilbur, of Pine Plains.

La Porte City Electric Light & Power Co., La Porte City, Ia.; $15,000; Pres., W. D. Wagoner; Secy. and Treas., A. Van Valkenburg; directors, J. E. Graham, A. L. Walker.

Newark Electric Developing Co., Newark, N. J.; $100,000, with $1,000 paid in, to manufacture electrical appliances and machinery; Augustus Demarest, Eugene Eagles, Chas. H. Madison, James H. Reinhardt, Newark, N. J.

BRIDGES.

MANCHESTER, N. H.—E. K. Turner, of Boston, has prepared plans and estimates for a seven-span stone bridge over the Merrimac River at Granite St., estimated to cost $100,000. The council is undecided whether to have the bridge 60 or 70 ft. wide.

CAMBRIDGE, MASS.—Plans have been prepared by the city engineers of Boston and Cambridge for a bridge over the railway tracks on Magazine St., in Ward 4, estimated to cost from $250,000 to $300,000.

BROOKLYN, N. Y.—The following bids were received July 29 for the construction of a lift bridge over Newtown Creek, as advertised in Engineering News. Engr., John J. McLaughlin, of Jamaica, N. Y.; Theodore Koehler, Chn. Com.:

Edge Moor Bridge Co., Wilmington, Del.	$440,700
Arthur McMullen, New York	431,000
King Bridge Co., Cleveland, O. (aw'd cont'ct).	418,000
M. J. Dady, Brooklyn	440,000
Dean & Westbrook, New York	427,890
Schultz Bridge & Iron Co., Pittsburg, Pa.	475,000
Berlin Iron Bridge Co., East Berlin, Conn.	423,500

The new bridge will be of an improved type, similar in construction to the Halstead St. bridge in Chicago. Its total length will be about 160 ft., total water span 140 ft., and total height to minarets 205 ft. The hoisting apparatus will be run by electricity and the roadway of the bridge will be hoisted 144 ft. in 40 seconds. A landing will be built about 30 ft. from the ground and stairways will lead to this from each side. This feature will be for the benefit of foot passengers. The bridge will be lifted to this point when long strings of scows or tugs are passing below, and passenger traffic will in this way be left uninterrupted. The system of counter-weights and hoisting machinery will all be stationed in the north tower. Iron cupolas will surmount the two towers, which will be connected by an arch of lattice ironwork. The advantage of a lift bridge over the old-fashioned turntable style now in vogue is apparent. A clear channel of 21 ft. in depth will be left. The bridge must be completed within nine months after the contract is signed.

BUFFALO, N. Y.—The council has directed the board of public works to prepare plans and advertise for bids for building a new iron plate girder bridge over Scajaquada Creek at Genesee St. Mark S. Hubbell, Cy. Clk.

ELMIRA, N. Y.—The Elmira Bridge Co. has been awarded the contracts, at $109,745, for building a bridge across the Chemung River at Madison Ave., having four spans of 146 ft. each, with 38 ft. for the roadway and two sidewalks, and for a bridge over the same river at Walnut St., having six spans of 146 ft. each. The other bids were as follows: Owego Bridge Co., Owego, N. Y., $113,000; Pennsylvania Steel Co., $113,980; Union Bridge Co., Athens, Pa., $114,500; Havana Bridge Co., Havana, N. Y., $114,700; Horseheads Bridge Co., Horseheads, N. Y., $114,900.

SYRACUSE, N. Y.—The following bids were received July 23 by Geo. W. Aldridge, Supt. Pub. Wks., Albany, for building a bridge over the inlet to Otisco Lake:

Michael Bennett, of Utica	$14,742
Brayer & Albaugh, of Rochester	10,172
A. Cady Palmer, of Fayetteville	8,429
Edward S. Candee, of Syracuse (aw'd contract).	6,290
Hughes Bros., of Syracuse	7,823

JERSEY CITY, N. J.—Bids for the construction of a bridge, 61 ft. span, and building abutments on Montgomery St., over Cornelison Ave., were received as follows: Post & McCord, iron plate girder, $11,500; Clark & Co., Melan arch, $10,250. It is reported that the contract has been awarded to Clark & Co.

WESTWOOD, N. J.—The committee of the board of chosen freeholders has received the following bids for building two iron bridges, with stone abutments, at Woodcliff: Owego Bridge Co., $3,557; J. T. Rowland & Co., $4,325; Hanover Bridge Co., $3,980; J. W. Stagg, $3,270 (awarded contract); Dean & Westbrook, $3,350; Tavaniere & Johnson, $3,415.

LANCASTER, PA.—The commissioners have received the following bids for repairing the Hinkletown bridge over the Conestoga Creek: B. Doutrich, $3,500; G. F. Goodman, $2,900; G. W. Wenger, $2,270 and $1,596; George E. Jones, $2,647 and $3,600; W. W. Upp, $2,287; E. McMellen, $1,947, $2,967 and $2,567.

NORRISTOWN, PA.—Bids are asked until Aug. 21 for constructing the superstructure of two wrought iron truss bridges to be built at the following named places: One over the Perkiomen Creek at Schwenksville and one over Swamp Creek, New Hanover township. Certified check, $500. E. Eisenhans, Clk. Comrs. Montgomery county.

PHILADELPHIA, PA.—It is reported that the Reading R. R. has asked for bids for the erection of a new through iron girder bridge over Haines St., Germantown, on the line of its Germantown & Chestnut Hill branch. The new bridge will be a double-track structure, about 70 ft. long and will replace the present single-track bridge.——Plans for two bridges on the line of the Pennsylvania & New Jersey R. R., one at Tulip and Luzerne Sts., and the other across Delaware Ave., north of Lewis St., have been approved by the councils.

SCRANTON, PA.—The council of West Scranton has adopted an ordinance authorizing the city engineer to prepare plans for a viaduct on West Lackawanna Ave., between Seventh and Ninth Sts.

ELKTON, MD.—The county commissioners will be petitioned Aug. 13 to build an iron highway bridge over Little Elk Creek on the road leading from the Elkton and Blue Ball road to the Marley road.

WASHINGTON, D. C.—Maj. Chas. E. L. B. Davis is making surveys for a bridge over the Anacostia River from South Capitol St. to Congress Heights. An appropriation for beginning the work was passed by the last congress.

HENRIETTA, N. C.—Bids are asked until Aug. 10 for building a 200-ft. iron or steel bridge over a river. Address S. B. Tannar.

PORT GIBSON, MISS.—Bids are asked for building a wooden or iron bridge over Commissioners Creek. A. K. Jones, Clk. Bd. Supervisors.

CINCINNATI, O.—It is reported that the state is considering a plan for a bridge over the entire length of Cheapside Basin, from Eighth St. to Court St.

ECORSE, MICH.—The township boards of Ecorse and Springwells have accepted plans prepared by the Detroit Bridge & Iron Co. for an iron and steel swing bridge, 110 ft. in length and with a 24-ft. roadway, and two 6-ft. sidewalks over the River Rouge. The bridge is estimated to cost about $25,000, as stated in our issue of last week. The plans will be submitted at once to the county supervisors for approval, after which bids for the construction will be asked.

CHICAGO, ILL.—An offer made by Chas. T. Yerkes, Pres. North Chicago St. Ry. Co., to contribute $25,000 on the part of the railway company to aid in the construction of a new bridge over the river at Halstead St., estimated to cost $100,000, has been accepted by the city.

PEORIA, ILL.—Plans are to be prepared for a new bridge at Bridge St. A structure higher than the present one is proposed, thereby saving the construction of a draw.

ROCKFORD, ILL.—It is reported that the committee on roads and bridges has recommended an appropriation of $1,100 to pay one-half of the cost of a new bridge over Dry Run, in Roscoe, where the same is crossed by the highway leading from Roscoe to Beloit. A committee of three has been appointed to assist in letting the contract.

STOCKTON, ILL.—Bids are asked by the committee and the commissioners of highways until Aug. 10 for erecting three iron bridges in Pleasant Valley, as follows: Over Spring Valley, 60 ft. in length; over Hillmers Branch, 22 ft., and over Daves Branch, 36 ft. The roadway of each will be 12 ft. in width. W. S. McFadden, County Com.; Robert Irvin, Highway Comr.

TAYLORVILLE, ILL.—The county board is reported to have decided to erect two iron bridges. A. D. Housley, Chn.; S. C. Mull, Clk.

PLYMOUTH, WIS.—The following bids were received July 23 for building a Melan concrete arch bridge over the Mullet River on Eastern Ave.: Keepers, Wynkoop & Thatcher, of Detroit, Mich., $2,640; Wm. Forrester, of Milwaukee, $3,170; Radtoff & Runge, of Plymouth, $2,175. All bids were rejected. T. K. Ackerman, Cy. Clk.

PORTAGE, WIS.—Bids are asked by the joint committee and the town board of Pacific until Aug. 10 for building a new stone or iron bridge over Fox River.

MINNEAPOLIS, MINN.—The council has authorized the city clerk to advertise for bids for the construction of the substructure of the proposed new bridge across the railroad tracks at Seventh St., north.

CHURCHS FERRY, N. DAK.—Bids are asked until Aug. 15 for building a bridge between Towner and Ramsey counties. A. J. Kildahl, Comr. Ramsey County, Meza, N. Dak.

OLIVET, S. DAK.—Bids are asked until Sept. 2 for constructing an iron or wooden 30-ft. span pile bridge over Dry Creek. Paul Dekker, County Audr.

STANTON, NEB.—Bids are asked until Aug. 13 for the construction of a steel or wooden bridge, 150 ft. in length, over the Elkhorn River. Louis Smithberger, County Clk.

DENVER, COLO.—Bids are asked until Aug. 12 for a pile-bent trestle bridge over the South Platte River at Alameda Ave. E. Monash, Pres. Bd. Pub. Wks.

PAWANEE, OKLA.—It is reported that W. T. Mahan is preparing plans for an 80-ft. wood and iron bridge over Black Bear Creek, 1¼ miles west of this place.

TRENTON, MO.—It is reported that the bridge commissioner has been directed to advertise for bids for building an iron span bridge on wood piling.

STOCKTON, CAL.—John Worlington, of Oakland, has been awarded the contract for building the trestle over Mormon channel at Taylor St. for the San Joaquin Valley R. R. Co. The work will require 60,000 ft. of lumber and 120 piles.

BUILDINGS.

MANCHESTER, N. H.—Wm. M. Butterfield has prepared plans for a three-story brick school building 198 × 86 ft., to cost $175,000. Wm. C. Clarke, Mayor.

PROVIDENCE, R. I.—Bids are asked until Aug. 12 for erecting an addition to the Potter's Ave. school building. David Barton, Chn. Com.; D. F. Hayden, Clk.

ELMIRA, N. Y.—Pierce & Bickford have prepared plans for a five-story brick sanitarium 120 × 55 ft., to cost $120,000, for the Clifton Springs Sanitarium Co.

NEW YORK, N. Y.—Bids are asked until Aug. 19 for work and material necessary to make water-tight the boiler-room, coal-room, cellar, etc., in the court house and prison now in course of erection for use of the 7th District Police Court and the 11th Judicial District Court, on West 53d and 54th Sts., between Eighth and Ninth Aves. William Brookfield, Comr. Pub. Wks.—Plans have been filed by the city for a $200,000-pumping station at 10th Ave. and Harlem River, between 178th and 180th Sts., for the Croton Aqueduct.

NEW YORK, N. Y.—Bids are asked by the armory board until Aug. 14 for completing the armory building on Madison Ave., extending from 94th to 95th Sts. Arch., John R. Thomas, 160 Broadway; Brig.-Gen. Louis Fitzgerald, Col. William Seward, Bd. Armory Comrs.—Bids are asked by the department of public parks until Aug. 14 for erecting the west wing of the American Museum of Natural History building in Manhattan Square, as noted in our issue of last week. The proposed extension will be 156 × 67 ft. and five stories in height, and the estimated cost is about $300,000. Some alterations and repairs are to be made to the present buildings of the museum. A partition will be built across the third floor of the westerly building, and the basement of the same building is to be arranged for exhibition purposes. The old shops at the north end of the center building are to be removed. In the cellar of the building will be placed a new electric light plant, consisting of a 150-HP. engine and 100-KW. multipolar slow-speed dynamo. Archs., Cady, Berg & Lee.

NIAGARA FALLS, N. Y.—Bids are asked until Aug. 15 for constructing a church building for the German Evangelical United Zion Church at Michigan Ave. and 10th St. Archs., Geo. W. Wright & Co., Gazette Block.

RAHWAY, N. J.—The reformatory committee, consisting of Patrick Farrelly, Pres. American News Co., Morristown, N. J.; Thos. M. Gopsill, of Jersey City; Wm. A. Ure, of Newark; D. M. Chambers, of Camden, and J. J. Daly, Mayor of Rahway, has chosen a site for a new reformatory building on Hazelwood Ave., in this city, for which $100,000 was appropriated by the legislature last March to begin the work.

PHILADELPHIA, PA.—Plans have been prepared by T. W. Rees, of New York, for a 10-story building for the New York Mutual Life Insurance Co. at 1007-1011 Chestnut St., estimated to cost $300,000.

PHILADELPHIA, PA.—The public building commissionhas decided to ask the councils for an appropriation of $1,250,000 to carry on the work of building the city hall, which it is thought can be completed in another year, if an appropriation of $3,500,000 can be secured. Franklin M. Harris, Pres. Pro Tem. Com.

PITTSBURG, PA.—Plans are asked until Nov. 1 for a new 20-room school building in Highland sub-district, on Margaretta St., East End. D. A. Stevenson, Secy. School Bd.

PITTSBURG, PA.—Plans have been prepared for new buildings for the Zoo in Schenley Park, estimated to cost about $125,000. Arch., J. H. Slisbee, of Chicago; E. M. Bigelow, Dir. Pub. Wks.

WASHINGTON, D. C.—It is reported that bids will soon be asked for erecting a union station, to be 350 ft. long and cover eight tracks. C. H. Hudson, Ch. Engr., Southern R. R. Co., Pennsylvania Ave.

WHEELING, W. VA.—Bids are asked by the committee of the Pythian Castle Association until Aug. 10 for erecting a three-story brick building for the association at Chapline and 27th Sts. Archs., Chas. P. Hamilton & Son; Geo. W. Weisgerber, Chn.

SAVANNAH, GA.—Bids are asked until Aug. 23 for constructing a court house and post office building. Wm. Martin Aiken, Supervising Arch., Washington, D. C.

BOLIVAR, TENN.—Bids are asked until Aug. 29 for erecting an insane asylum. Address Austin Miller, 42 Madison St., Memphis; J. P. Douglas, Supt. Western Hospital, Bolivar.

CINCINNATI, O.—Bids are asked by the directors of the university until Aug. 19 for a new hall for the institution, the work to include iron, masonry, brick, etc., according to reports. Archs., Samuel Hannaford & Sons, Hulbert Block. Address J. M. Robinson.

COLUMBUS, O.—Fred W. Elliott, Wheeling Bldg., has prepared plans for Frank E. Powell for a five-story brick apartment house, 132 × 106 ft., to cost $120,000.

DETROIT, MICH.—Bids are asked until Aug. 20 for erecting the Livernois school building. L. H. Chamberlin, Secy. Bd. Education.—A building permit has been granted to Marshall H. Godfrey and Benjamin Hyde for a 14-story brick store and office building at 125 to 139 Woodward Ave., to cost $700,000.

CHICAGO, ILL.—Bids are asked by the board of education, 109 Randolph St., until Aug. 12 for erecting a 9-room school building at Ohio and Lincoln Sts. Arch., August Fiedler.

CHICAGO, ILL.—A building permit has been granted to the Illinois Tax Abstract Co. for a 11-story brick office building at 160-162 Washington St., to cost $250,000.

NORMAL, ILL.—Bids are asked by the board of education of Illinois until Aug. 15 for erecting a new heating and ventilating plant for the main building for the state normal university at Normal. Arch., Geo. H. Miller. Address Chas. L. Capen, Bloomington, Ill.

DENVER, COLO.—The Denver Consolidated Tramway Co. is about to erect a new station and is also preparing plans for two large store and office buildings, as noted more fully under Street Railways. Consult. Engr., John A. Beeler.

ST. LOUIS, MO.—Bids are asked until Aug. 12 for constructing hot-blast (fan) heating apparatus in the Jefferson, Divoll, Blow and L'Ouverture school buildings. Louis J. Holthaus, Chn. Com.; C. L. Hammerstein, Secy. Com. Bd. Pub. Schools.

ST. LOUIS, MO.—J. L. Wees, Commercial Bldg., has prepared plans for a market building 500 × 200 ft., to cost $300,000.—Link, Rosenheim & Ittner, Union Trust Bldg., have prepared plans for a brick church 145 × 80 ft. for the Shaare Emeth congregation, to cost $100,000.

NEW WHATCOM, WASH.—Plans are asked by the trustees of the state normal school until Aug. 21 for a new building on Sehome Hill, the building to cost about $36,000. O. H. Culver, Clk.

LOS ANGELES, CAL.—Bids are asked until Aug. 12 for putting heating and ventilating apparatus in the school buildings of the city. C. W. Luckenbach, Cy. Clk.

IRRIGATION.

GREELEY, COLO.—It is reported that a company has been organized to build embankments around a basin about two miles northeast of Loveland, which will make a reservoir 3½ miles long by 1 mile wide, and having a capacity of 1,500,000,000 cu. ft. of water. The reservoir will be filled from the Big Thompson River, Fossil Creek, and the Cache la Poudre River. The basin was surveyed about five years ago by Ditch Co. No. 2, and the estimated cost of constructing the reservoir at that time was $100,000. B. D. Sanborn, of Greeley, and others of Denver and Loveland are interested.

SALT LAKE CITY, UTAH.—Local papers state that all of the necessary preparations have been made and the work of construction on the canal of the New State Irrigation Co., recently organized for the purpose of reclaiming several thousand acres of lands north of the Hot Springs lake, was to be resumed on Aug. 1. The executive officers of the company have effected the purchase of a tract of land which blocked the way of the canal, and this now leaves half a mile of open way. It is anticipated that the Shaffer compromise will soon be effected.

MARYSVALE, UTAH.—It is reported that the dam for the reservoir being built for the Marysvale Reservoir Co. in Sevier Canyon, below Marysvale, has been completed, and surveys are now being made for a second reservoir several miles up the canyon.

WATER-WORKS.

UNION, ME.—The Union Water Co. has been organized with a capital stock of $10,000 to supply this town with water; Pres., Fred. A. Alden; Treas., O. A. Burkett.

CONTOOCOOK, N. H.—Preliminary surveys for the proposed works have been made by Geo. P. Hadley, G. A. Curtice, Chn. Com.

SUNCOOK, N. H.—By a vote of 248 to 85 the town of Pembroke has accepted an offer of Frank Jones, of Portsmouth, principal stockholder of the Suncook Water Co., to supply this village with water for domestic and fire purposes. The plant will require about four miles of 12-in. mains and 50 hydrants, according to the reports. Fred G. Evans, Town Clk.

ACTON, MASS.—Press reports state that surveys are being made preliminary to the construction of works in this town.

CLINTON, MASS.—The water board has purchased Heywood's Mill Pond as an additional water supply.

GLOUCESTER, MASS.—At a special election it was voted, 1,648 to 33, to accept the legislative act permitting municipal works. The act provides for the purchase of the plant of the Gloucester Water Co. if offered to the city within 30 days from the acceptance of the act by the city.

WATERBURY, CONN.—Bids are asked until Aug. 29 for clearing a part of the basin of the Wigwam reservoir, as stated in our advertising columns. R. A. Cairns, Cy. Engr.

AVOCA, N. Y.—The water commissioners are reported to have decided to build a new reservoir.

BALLSTON SPA, N. Y.—The commissioners have engaged Harvey M. Geer to make investigations for an additional water supply. L. D. Sherwood, Secy.

BROOKLYN, N. Y.—The mayor has appointed J. A. Deknatel, William Krammer and S. M. Giddings as commissioners to fix a fair value on the works at Gravesend, which the city is to acquire under an act of the late legislature.

BUFFALO, N. Y.—The mayor has vetoed the award of the contract for a new 30,000,000-gallon pumping engine to the Lake Erie Engineering Works, and the council has voted to readvertise the work. The bids were published last week under Contract Prices.—The council has voted to appoint a committee to employ an engineer to investigate the pumping capacity of the works.

CAPE VINCENT, N. Y.—The contract for constructing works has been awarded to Beckwith & Quackenbush, of Herkimer, N. Y., at $22,276. W. J. Temper, of Watertown, bid $30,231, and M. L. Cleveland, of Watertown, $28,508. These were the only bids received for the complete plant.

CARTHAGE, N. Y.—The citizens of West Carthage will vote Aug. 20 on an appropriation of $18,500 for the construction of works, the water supply to be from the Carthage pumping station. Dr. G. D. Hewitt, Chn. Comrs.; S. M. Gibbs, Secy. Comrs.

COLLEGE POINT, N. Y.—The proposition to issue $20,000 in bonds for a stand-pipe was defeated at the election July 29. The site for the stand-pipe had already been purchased.

MOUNT MORRIS, N. Y.—Bids are asked until Aug. 22 for constructing works for the Craig Colony for Epileptics, Sonyea, Livingston county, N. Y. The work will require about 218 tons of pipe, 15 hydrants, 15 × 75-ft. stand-pipe, pumps, wells, etc. Consult. Engrs., Voorhees & Witmer, Buffalo; Engr., Newcomb Carlton, 109 White Bldg., Buffalo.

NYACK, N. Y.—Jas. S. Haring, Engr., has reported to the board of water commissioners a plan for a complete new system of works, embracing about 15 miles of pipe, with 82 hydrants, at a cost with pumping station and 2 reservoirs, of about $135,000; source of supply from driven wells in the Hackensack Valley. The matter will be submitted to a vote in a few weeks.

PHOENIX, N. Y.—The Phoenix Water Supply Co. was incorporated Aug. 6 as a reorganization of the Phoenix Water Co.; capital stock, $45,000; directors, O. F. Gaylord, G. B. Sloan and others of Oswego, N. Y.

PINE PLAINS, N. Y.—John R. Thompson, of Amenia, N. Y., Supt. Pine Plains Water Co., writes us that the construction of works is now under way. The supply will be from wells, and an electric light plant will be put in in connection with the waterworks.

PRATTSBURG, N. Y.—It is stated that a company is ready to construct a water-works and electric light plant if the trustees will grant a franchise. The citizens have twice voted against municipal works.

RED HOOK, N. Y.—D. W. Wilbur, Pres. Comrs., writes us that the contract for works recently awarded to Van De Bogert & Haynes was not closed, as the contractors refused to sign the contract. The contract has now been awarded to G. G. Harter, of Herkimer, N. Y., for furnishing and laying pipes, furnishing and setting hydrants, valves, etc. The bids were published in our issue of July 18.

RHINEBECK, N. Y.—The American Steam Heating Co. has petitioned for a franchise for works, the village to pay $20 a year each for 30 hydrants.

RIPLEY, N. Y.—A committee is investigating the question of works; supply will probably be by gravity from springs. Address F. N. Randall.

SCHENECTADY, N. Y.—A correspondent writes us that the construction of the new system is being pushed as rapidly as possible, and that the Stanwix Engineering Co. is now preparing plans for the pumping station, etc.

STAPLETON, N. Y.—The contract for constructing works at the county farm has been awarded to J. B. Newhall & Co., at $2,337.

ST. JOHNSVILLE, N. Y.—Bids are asked until Aug. 22 for the construction of an additional water supply system, as stated in our advertising columns. O. Williams, Chn. Comrs.

YONKERS, N. Y.—The water commissioners have been granted authority to issue $100,000 in bonds.

YORKSHIRE, N. Y.—A public meeting was held last week to discuss the question of works.

BORDENTOWN, N. J.—The incorporation of the Citizens' Pure Water Co., with a capital stock of $50,000, was noted in our issue of July 25. It is stated that a franchise has been granted, and that works will probably be constructed at an early date. The supply will be pumped from artesian wells to a stand-pipe. Henry M. Sigle, Third and Arch Sts., Philadelphia, was one of the incorporators.

CAMDEN, N. J.—The water committee of the council has decided to advertise for bids for furnishing the city with pure water. The question of a better water supply has been under consideration for several months.

ALLENTOWN, PA.—The Monongahela Water Co. has contracted with R. Monroe & Son, of Pittsburg, for a water tank 60 ft. in diameter and 40 ft. high, to be erected at this place. Engr., S. Diescher, Mount Washington.

EAST BRADY, PA.—R. R. McGregor, Clk., writes us that nothing definite has yet been decided in regard to the proposed works at this place; population, 1,300.

FREELAND, PA.—It is stated that Wilkes Barre capitalists are talking of putting in works at this place.

GROVE CITY, PA.—Dr. J. M. Martin, Dr. I. C. Ketler, W. J. Harshaw, and others are reported to have applied for a charter to put in works at this place; capital stock, $10,000.

HARFORD, PA.—A press report states that pipe has been purchased and that the construction of works will be commenced at once; water supply from Tyler Lake.

HARRISBURG, PA.—Bids are asked until Aug. 13 for laying a 6-in. main in two streets. E. Mather, Pres. Comrs.

ROCHESTER, PA.—J. P. Leaf, Borough Engr., has been directed by the council to prepare plans and specifications for new works. The Union Water Co., of Beaver Falls, is now supplying the place.

PITTSBURG, PA.—Bids are asked until Aug. 9 for furnishing and erecting two 12,000,000-gallon pumping engines at the Brilliant pumping station, and two 5,000,000-gallon pumping engines at the Herron Hill pumping station, with boilers, etc., and also for furnishing and putting in an intake crib with 40-in. pipe and fittings for same. E. M. Bigelow, Dir. Pub. Wks. ——The Mountain Water Co. was incorporated Aug. 5 with a paid-up capital stock of $1,000; Treas., C. F. Patterson, Allegheny.

WATSONTOWN, PA.—The White Deer Water Supply Co. was incorporated Aug. 3, with a capital stock of $5,000, with $500 paid in. Treas., C. D. Berger.

BALTIMORE, MD.—The county commissioners have granted permission to the Chesapeake Electric & Water Co. to lay water mains along the Philadelphia road and First St., to connect the company's station at Herring Run with a stand-pipe at First St. and Canton Ave.; also to lay distributing mains from the stand-pipe to the streets of Highlandtown and Canton.

SWANSBORO, VA.—A committee is reported to have been appointed to secure plans for a water supply.

ABERDEEN, MISS.—James M. Acker, Mayor, writes us that the city is considering the question of works, but that nothing definite has yet been decided upon.

ELIZABETHTOWN, KY.—Bids are asked until Aug. 19 for constructing works. Ch. Engr., S. K. Felton, Cuthbert, Ga.; R. L. Wintersmith, Mayor.

HOPKINSVILLE, KY.—The granting of a franchise to Samuel R. Bullock, of New York, and the proposed immediate construction of works, which will include 9½ miles of mains, was noted in our issue of last week. The Hopkinsville Water Co. was incorporated in New Jersey Aug. 1, with a paid-up capital stock of $100,000, by Chas. M. Berrian, Robert M. Cole, S. R. Bullock and Benj. W. Homans, of New York city, and Ambrey G. Haven, of Fairview, N. J.

HAMILTON, O.—A committee of 25 has reported in favor of the proposed issue of $65,000 in bonds for improving the works. John Fisher, Secy. Water Bd. ——An agitating committee has been appointed to urge the proposed issue of bonds for water-works improvements. B. H. Macke, Secy.

LOGAN, O.—Lewis Myers, of Wapakoneta, is reported to have been the lowest of 18 bidders for the construction of works, at $45,473 for the plant complete. It is reported that this is in excess of the appropriation, and that the work will probably be readvertised.

MILLERSBURG, O.—Bids are asked until Sept. 2 for constructing works, as described in our advertising columns. Engr., Burton J. Ashley, Chicago; J. G. Walkup, Clk.

OSBORN, O.—Bids are asked until Aug. 19 for constructing works and an electric light plant, according to reports. Consult. Engr., William G. Koler, Springfield, O.; O. B. Kauffman, Cy. Clk.

YOUNGSTOWN, O.—Bids are asked until Aug. 19 for the purchase of $160,000 in bonds, recently voted for extending and improving the works. D. H. Simpkinson, Secy., writes us that it is proposed to purchase two 5,000,000-gallon pumping engines and lay about 10 miles of pipe.

JASPER, IND.—Bids are asked until Aug. 24 for furnishing materials for the construction of works at this place, for which Sanders & Porter, of Louisville, Ky., have been engaged to prepare plans and superintend the construction.

LOGANSPORT, IND.—A contract for extensions is reported to have been awarded to Stevens & Bedwards, at about $20,000.

ROYAL CENTER, IND.—At an election July 29 the citizens voted to construct works, estimated to cost from $5,000 to $8,000.

EATON RAPIDS, MICH.—An election will be held Aug. 19 to vote on an issue of $27,000 in bonds for water-works and $8,000 for an electric light plant. J. B. Hender, Secy. Comrs.

FLUSHING, MICH.—Bids are asked until Aug. 20, according to reports, for constructing works and an electric light plant. Engr., H. H. Humphrey, 66 East High St., Detroit.

CHICAGO, ILL.—The county board has decided to add a stand-pipe to the water supply system being put in at Dunning.

CLINTON, ILL.—Press reports state that an election will be held Aug. 10 to vote on an issue of $6,000 in bonds to secure an additional water supply and make other improvements to the works. The supply is from a well.

HARLEM, ILL.—W. T. Griffith, 419 Chamber of Commerce Bldg., Chicago, Engr. for the new water supply, informs us that W. H. Gray & Bros., Chicago, have been awarded the contract for sinking the artesian well, and that the Stilwell-Bierce & Smith-Valle Co. is to furnish the air-lift pumping machinery.

JOLIET, ILL.—Johnston & Harrison have submitted a proposition to the council to supply the city with 6,000,000 gallons of water a day from artesian wells and to construct an electric light plant with a capacity of 250 arc lights of 2,000 c. p. each. The cost of the plant is to be put at $200,000, and the city is to receive all profits above 6% on the $200,000, the profits to be applied towards the purchase of the plant.

VIRGINIA, ILL.—Geo. Conover writes us that the proposed water company did not secure sufficient subscriptions for stock, and that the project is at a standstill.

LANCASTER, WIS.—Bids are asked until Aug. 22 for constructing works, as described in our advertising columns. August Michaelis, Cy. Clk.

FOND DU LAC, WIS.—The council voted to receive bids this week for the construction of a dam at the foot of Forest St.

WAUWATOSA, WIS.—The county supervisors have decided not to have the Milwaukee mains extended to this place at present, and have contracted with Gray Bros. to sink an artesian well to cost $8,700.

OELWEIN, IA.—Bids are asked until Aug. 21 for furnishing materials and constructing works, as stated in our advertising columns. W. S. Huntington, Engr.; H. V. Hoyer, Recdr.

ROCKWELL CITY, IA.—Fremont Turner, of Des Moines, has been engaged to prepare plans and specifications for works at this place. Geo. W. Spencer, City Clk.

SIGOURNEY, IA.—Bids are asked until Aug. 28 for constructing works, as noted in our advertising columns. Consult. Engr., Geo. W. Wynn, Cedar Rapids, Ia.; J. P. Talby, Mayor.

BIRD ISLAND, MINN.—An election was held Aug. 6 to vote on the question of water-works.

BROWNTON, MINN.—At a special election July 29 it was voted to issue $6,000 in bonds for works.

FAIRFAX, MINN.—At a special election July 30 the citizens voted to issue $4,500 in bonds for works. It is stated that works were constructed at this place four years ago, at a cost of about $5,000, but that the council refused to accept the plant.

NEW PRAGUE, MINN.—The contract for constructing works has been awarded to Fairbanks, Morse & Co., of St. Paul, at $7,875.

REDWOOD FALLS, MINN.—The contract for constructing works is reported to have been awarded to J. M. Maurier, of Minneapolis.

WEST CONCORD, MINN.—A petition is being circulated asking for a special election to vote on an issue of bonds for works.

HELENA, MONT.—B. C. Riblet, Consult. Engr., of Spokane, Wash., has reported three propositions for works, the estimated cost of each being from $563,000 to $872,000. Massena Bullard, Cy. Clk.

HUTTO, TEX.—The citizens are reported as discussing plans for securing a water supply.

TROY, TEX.—The Artesian Water Co. is reported to have been incorporated with a capital stock of $10,000 by D. W. Glasson, C. L. Meyers and others.

GUTHRIE, OKLA.—The proposed extensions, recently noted, will include the construction of a 10-ft. tunnel, 80 ft. long, for a better water supply. Geo. M. De Groff, Cy. Clk.

SAN JOSE, CAL.—The Citizens' Water Co. is reported to have been incorporated with a capital stock of $1,000,000; principal place of business, San Francisco; directors, Chas. N. Felton, of Menlo Park; Chas. D. Wright and J. M. Moorehead, of San Jose, and J. D. Fry and E. G. Wheeler, of San Francisco.

POMONA, CAL.—It is stated that the committee investigating the question of water supply will be ready to report some time this month. I. R. Garthside, Cy. Clk

ORANGEVILLE, ONT.—The contract for constructing works has been awarded to Shields & Gowanlock, of Toronto, at $37,500. An additional contract will soon be awarded for pumping station and pumping machinery having capacity of 700 gallons a minute. The bids for constructing works were as follows; Engr., Willis Chipman, of Toronto:

Shields & Gowanlock, Toronto	$37,500
McCarthy & Plummer, Sudbury	39,155
Clark & Connolly, Toronto	39,390
McQuillan & Co., Toronto	39,598
H. Farquier, Toronto	45,727
Jas. Bowers, Orangeville	47,975
Engineer's estimate	48,200

MIDDLETON, N. S.—A press report states that the town has voted to purchase the works and that C. O. Foss has been chosen as arbitrator for the town.

GARBAGE DISPOSAL.

BRIDGEPORT, CONN.—The contract for two 100-HP. boilers and two large tanks for the garbage disposal plant has been awarded by Cyrus Currier, of Newark, N. J., builder of the Holthaus plants, to the Passaic Rolling Mill Co., of Paterson, N. J., according to press reports. The contract for the masonry work for the buildings has been let to H. M. Purdy, of Bridgeport, and the construction commenced.

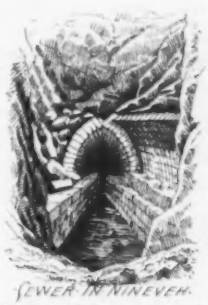
NEW YORK, N. Y.—Geo. E. Waring, Jr., Comr. of St. Cleaning, is quoted as stating that he has examined over 40 plans for garbage disposal, and that he has decided to establish a crematory at West 53d St., near the North River, at a cost of $5,800, where the city can make $65 a day out of garbage and refuse. Herbert Tate, Engr., 21 E. 20th St., is building the plant.

CLEVELAND, O.—The sanitary commission, composed of delegates from the various city organizations, is investigating the question of garbage disposal. Pres., L. E. Holden; Secy., Dr. P. Max Foshay.

CHARLOTTE, N. C.—Press reports state that this city is considering the erection of a garbage crematory.

CHICAGO, ILL.—Local papers state that Mayor Swift has received a proposition from the Chemical Reduction Garbage Co. to erect a plant for the disposal of garbage. The plan proposed is for the city to allot space for the erection of the plant, which will be built entirely at the company's expense, for the purpose of testing the system. The mayor directed the comptroller to find a site and afford the company an opportunity to show what its system can do. According to the statements, a plant 25 x 70 ft. of five retorts will dispose of 500 tons of garbage daily. No fuel is needed and no smoke-stack necessary. The retorts are sealed and, it is said, give off no odor whatever, allowing the erection of such a system in the center of the city or in thickly populated districts.

SEWERAGE.



MEDFORD, MASS.—Bids are asked until Aug. 10 for constructing 3,250 ft. of 12 to 8-in. underdrains, the work to include 8,000 cu. yds. earth excavation, 600 cu. yds. brick masonry, 900 cu. yds. concrete masonry, etc. Engr., T. Howard Barnes, Medford; John D. Street, Chn. Comrs.

WALTHAM, MASS.—The committee is considering the question of constructing a sewer in Roberts St., at an estimated cost of from $25,000 to $35,000.

WORCESTER, MASS.—It is proposed to construct about five miles of 36 x 24-in. to 8-in. sewers. H. P. Eddy, Supt. Sewers; F. A. McClure, Cy. Engr.

LAWRENCE, MASS.—The committee received the following bids July 31 for constructing section 1 of the proposed sewer in ward 6, which is to extend from the Merrimack River to Newton St.:

A. W. Byrne, West Medford (awarded contract)	$38,339
F. A. Snow, Boston	44,401
William S. Marsh, Lawrence	43,460
Moulton & O'Mahoney, Lawrence	43,333
Patrick F. Brady, Lowell	42,307
Trumpold & Ryan, Lawrence	40,537

OLNEYVILLE, R. I.—J. W. Smith, F. A. Twitchell and F. L. Hanley have been appointed a committee to petition for a sewer in Plainfield St. from Odd Fellows Square to Olneyville Square.

ROCKVILLE, CONN.—Bids are asked until Aug. 15 for the purchase of $50,000 of 4% sewer bonds. This is a portion of an issue of $150,000 authorized by the general assembly April 10, 1895, for constructing a sewer system, plans for which have just been prepared, as noted in our issues of July 25 and Aug 1. E. L. Heath, H. L. Allen, F. T. Maxwell, Finance Committee.

ALBION, N. Y.—A petition is to be circulated for constructing a system estimated to cost from $95,000 to $81,000. This question was defeated at an election held in the spring, but if 60% of the taxpayers will sign the petition the work can be carried out. Edwin L. Wage, Chn. Com.

AVON, N. Y.—Bids are asked until Aug. 22 for constructing about 27,000 ft. of 8 and 6-in. pipe sewers, as stated in our advertising columns. Alva Carpenter, Pres. Comrs.

BUFFALO, N. Y.—The board of public works has been directed to prepare plans and advertise for bids for constructing 36 to 24-in. brick and 20 to 10-in. pipe sewers in a number of streets. M. S. Hubbell, Cy. Clk.

BROOKLYN, N. Y.—Bids are asked until Aug. 15 for constructing sewers in two streets. Alfred T. White, Comr. Cy. Wks.

COLLEGE POINT, N. Y.—Frank Hunold and others have petitioned for a better sewerage system.

DEPEW, N. Y.—The construction of a sewage disposal plant is being considered. D. E. Russell, Supt. Depew Improvement Co.

MECHANICSVILLE, N. Y.—The citizens voted July 30 to construct a system, at an estimated cost of $40,000.

NEW YORK, N. Y.—Bids are asked by the department of public works until Aug. 19 for constructing sewers in five streets.

NYACK, N. Y.—The sewer commissioners will again submit the question of constructing a system on the separate plan. James S. Haring, Engr., has submitted an exhaustive report on the plans proposed, which is to be put in the hands of each taxpayer, explaining the demands of the system and its cost, which, for 13.5 miles, is estimated at $48,000.

WATERLOO, N. Y.—It is reported that the trustees have directed the committee to construct a pipe sewer through an open ditch from North and Center Sts. to Elizabeth St., and to consider the advisability of building a sewer from Elizabeth St. to the canal. W. L. Sweet, J. Chas. Fillingham and M. E. Maloney compose the committee.

NEWARK, N. J.—It is proposed to construct pipe sewers in 10 streets. Engr., Ernest Adam; A. M. Linnett, Clk. Bd. St. Comrs.

CARBONDALE, PA.—The city engineer has prepared plans for a new sewer district.

EBENSBERG, PA.—The county commissioners have received the following bids for constructing a pipe sewer 4,000 ft. in length, with outlets into the Conemaugh River:

	15-in.	20-in.
P. F. Gillen, Gallitzin	$3,650	$3,900
F. A. Cresswell, Johnstown	3,627	4,554
Oliver Evans, Ebensburg	3,800	4,800
A. B. Cushing	4,433	4,917
J. A. Shoemaker, Ebensburg	4,187	4,650
E. B. Cresswell, Ebensburg	3,139	3,839
Hite & Co., Clearfield	1,934	2,922
J. H. Waters & Bro., Johnstown	2,821	4,433

WASHINGTON, D. C.—It is reported that the district commissioners are preparing to advertise for bids for constructing the Eckington sewer, which forms part of the Brookland system. This section will be 8 ft. in

diameter.——Another important project under consideration is the construction of the new Brookland sewer, for which an appropriation of $30,000 was made by the last Congress. This sewer, which is to be built in 5th St. to Rhode Island Ave., thence to 9th, and out 9th, is estimated to cost $74,000. The commissioners, however, are empowered to enter into a contract for a portion of the work, and the $30,000 will be so applied.——The commissioners are also considering the question of constructing the Rock Creek intercepting sewer, estimated to cost $130,000. An appropriation of $40,000 was made by Congress to begin the work.

FOSTORIA, O.—An election is to be held Aug. 20 to vote on the question of issuing $30,000 in bonds for a sewage disposal plant, as noted in our issue of July 25. John P. Force, Cy. Engr.

MARYSVILLE, O.—The state board of health is considering plans for constructing a system. The citizens will vote on the question in the fall.

BRAZIL, IND.—Bids are asked until Aug. 29 for constructing a 24-in. pipe sewer about 1,500 ft. in length. F. W. Sisson, Cy. Engr.

URBANA, ILL.—We are informed that the following bids were received July 24 for constructing sewers, as advertised in Engineering News; C. B. Holmes, Cy. Clk.:

Mayfield & Clark, Lincoln, Ill.	$3,681
Jas. N. Roche, Chicago, Ill.	3,864
T. S. Davy, Lincoln, Ill.	5,592
Wm. Davy & Son, Kenosha, Wis.	3,083
Campbell & Dennis, Joliet, Ill.	3,571
Dubuque Construction Co., Dubuque, Ia.	3,515
Shanahan & Kelley, Chicago (aw'd contract)	2,356

MEDFORD, WIS.—It is reported that the council has engaged an engineer to prepare plans for a system, and that a sewer 2,000 ft. long will be constructed in the fall.

MILWAUKEE, WIS.—The county board is considering the question of appropriating $10,000, as petitioned for by the state board of health for securing plans for a system in the Menomonee valley.

DAVENPORT, IA.—A petition is being circulated and will soon be presented to the council for constructing a 10-ft. brick main sewer along the bed of the creek in district No. 13.

DES MOINES, IA.—The plans for the new Bird's Run sewer, work on which has just begun, have been changed to make it 9 ins. larger. This will make it 7 ft. 9 ins. in the clear. Edward Wright and John Sherman, Bd. Pub. Wks.

DUBUQUE, IA.—The city engineer has been directed to prepare plans for sewers in two streets.

SALINA, KAN.—O. P. Hamilton has completed plans for a sewer to connect the government building with the city sewers.

INDEPENDENCE, MO.—Plans and estimates are being made for a separate system. Robt. H. Jones, Cy. Engr.

OAKLAND, CAL.—The following bids were received July 22 for constructing the east side sewer: Cotton Bros., $34,754; Cavanaugh & Chamberlain, $35,873; California Bridge Co., $38,343; Healy, Tibbits & Co., $38,931.

PASADENA, CAL.—Surveys have been made for a new outfall sewer, right of way for which is now being secured. It is reported probable that the system will be extended next year by the construction of 10 to 15 miles of pipe sewers. W. B. Clapp, Cy. Engr.

FREDERICTON, N. B.—The council has directed the city engineer to prepare plans for a system, estimated to cost $58,000. A sewage pumping station was recommended by Crafts & Forbes, who were in charge of the construction of the water-works.

WOODSTOCK, N. B.—An election has been called for Aug. 8 to vote on the question of issuing $10,000 in bonds for constructing sewers. An election was to have been held Aug. 1 to vote on issuing $25,000 in bonds for sewers, but was postponed, and the amount reduced.

MONTREAL, QUE.—It is proposed to construct a sewer in Constant Lane. Percival St. George, Cy. Surv.

STREETS AND ROADS.

BOSTON, MASS.—Bids are asked by the Massachusetts highway commission until Aug. 15 for grading a road in Hancock, Berkshire county, the work to include the following materials: 9,000 cu. yds. excavation or embankment, 200 cu. yds. ledge excavation, 200 cu. yds. rubble masonry laid dry, 100 lin. ft. 12-in. vitrified clay pipe, 5,000 lin. ft. of drain, 2,300 lin. ft. of guard rail, 10,000 lin. ft. of other fencing, 28 stone monuments, to be delivered and set. Ch. Engr., Charles Mills, 15 Court St., Boston.

HARTFORD, CONN.—The commissioners have recommended the paving of Maine and Asylum Sts. with asphalt.

ALBANY, N. Y.—It is proposed to pave two streets with brick and construct drains in two other streets. Wm. W. Dennin, Clk. Council.

AUBURN, N. Y.—Bids are asked until Aug. 19 for paving State St. with brick, as stated in our advertising columns. Orlando Lewis, Mayor; Frank B. Ives, Cy. Clk.

JAMAICA, N. Y.—It is reported that the following bids were received by the supervisors of Queens county July 30 for macadamizing; John J. McLaughlin, County Engr.: Hoffman Boulevard, about 6 miles in length, 18 ft. wide, Smith & Burden, Long Island City, $122,301; D. C. Bowker, Brooklyn, $85,346; and Twombley & Eldert, Jamaica, $78,573. North Hempstead Turnpike, 7 miles, 15 ft. in width, Tuohey & Co., Flushing, $82,836; D. C. Bowker, Brooklyn, $76,805; Twombley & Eldert, Jamaica, $70,736.

NEW YORK, N. Y.—Bids are asked until Aug. 15 for paving six streets with asphalt. Chas. T. Collis, Deputy Comr. Pub. Wks.

ROCHESTER, N. Y.—Bids are asked until Aug. 9 for cement sidewalks in two streets, and until Aug. 12 for paving Maple St. with asphalt.

SCHENECTADY, N. Y.—We are informed that the council has voted to pave Washington Ave. with asphalt, for which plans are being prepared.——The Metropolitan Paving Co. has completed paving Union St. with sheet asphalt and is now at work on State St., which will require nearly all the fall to complete.

ATLANTIC CITY, N. J.—The council has voted to pave Illinois Ave.

CAMDEN, N. J.—B. F. Sweeten & Son have been awarded three contracts for paving and Thos. A. Ward two contracts.

NEWARK, N. J.—Bids are asked until Aug. 15 for about 30,000 sq. yds. of granite and 31,000 sq. yds. of asphalt paving. J. C. Mundy, Supt. of Wks.

PLAINFIELD, N. J.—Plans and specifications are being prepared for the sewage disposal beds, covering about 25 acres, preparatory to advertising for bids after Aug. 20. The bids will probably be opened at the meeting of the council Sept. 2.

SHERADEN, PA.—Bids were asked until Aug. 7 for grading about 30,000 cu. yds. in nine streets in this borough. Engr., James B. Smith, 160 Fourth Ave., Pittsburg.

CINCINNATI, O.—The board of administration is considering the question of paving 3,000 lin. ft. of Eggleston Ave. with granite blocks, estimated to cost about $120,000.

MARION, O.—The lowest bids for 6,650 sq. yds. of brick paving in Delaware St. and 8,502 sq. yds. in Main St. were those of H. S. Hallwood, the only other bidder being P. Kelly & Co.

INDIANAPOLIS, IND.—Bids are asked until Aug. 17 for 23,200 sq. yds. of asphalt paving in Mississippi St., 12,400 ft. of curb, etc.——Resolutions have been adopted for 3,500 lin. ft. of brick, 1,340 lin. ft. of asphalt, and 1,300 lin. ft. of cement paving, the contracts to be awarded about Sept. 8. Chas. C. Brown, Cy. Engr.; J. H. Deane, Asst. Engr., Sts. and Surveys.

DETROIT, MICH.—The board of public works has voted to advertise for bids for about 10,000 sq. yds. of cedar block paving on concrete foundation in Kirby Ave., and for paving in Clifford and Adams Aves. James Dean, Pres. Bd. Public Wks.

GRAND RAPIDS, MICH.—The following are the estimates for paving two streets with different materials as proposed by the board of public works: Washington St., from Jefferson Ave. to South College: asphalt, $15,552; granite macadam, $11,322; sapless cedar on concrete, pitched, $11,468; same, not pitched, $10,211; common cedar, not pitched, $8,954; same on gravel, not pitched, $7,139. Colt Ave., from East Bridge to Fairbanks: asphalt, $16,652; macadam, $9,237; sapless cedar on concrete, pitched, $11,918; same, not pitched, $10,603; common cedar, pitched, $10,603; same on gravel, pitched, $8,631; same not pitched, $7,316; brick on concrete, $13,590; graded, graveled and gutters paved, $4,713.

CHICAGO, ILL.—Bids are asked until Aug. 12 for paving portions of 34 streets and alleys. W. D. Kent, Comr. Pub. Wks.

WINNETKA, ILL.—Bids are asked until Aug. 20 for 23,000 lin. ft. of macadamizing in ten streets, as stated in our advertising columns. C. W. Tostevin, Village Clk.

WAUKEGAN, ILL.—H. W. Large, Engr., has sent us a detailed statement of the bids received July 15 for paving two streets with brick, as advertised in Engineering News. Bids were submitted on various kinds of brick, the lowest total bid of each bidder for the work in Madison County and Washington Sts., 10,365 sq. yds., being as follows:

Rockford Construction Co., Rockford, Ill.	$14,317
Campbell, Dennis & Co., Joliet, Ill.	14,677
C. & T. Iglehart, Morgan Park, Ill.	15,402
Burns & Esson, La Grange, Ill.	15,476
J. B. Smith & Co., Chicago, Ill.	15,523
J. Merkey, Milwaukee, Wis.	15,661
Stuede & Co., Chicago, Ill.	16,111
A. W. Fletcher, Highland Park, Ill.	17,340
James Bairstow, Chicago, Ill.	17,517
Galloway & Blake, Waukegan, Ill.	17,100
Engineer's estimate	17,032

DUBUQUE, IA.—The council has directed the city engineer to prepare plans for paving Jones St. with brick and to advertise for bids for paving 15th St. with brick.——The following bids have been received for paving Locust St., from 10th to 17th St., with brick: Kenety & McCann, $14,790; James McDonald, $13,750; E. C. Blake, $14,644; Dubuque Construction Co., $14,524; Steuck, O'Farrell & Linehan (awarded contract, and also contract for paving Fourth St. with brick, at $3,940), $13,180; John Pickley, $16,086. T. J. Cooney, Cy. Recdr.

SEATTLE, WASH.—Bids are asked by the committee until Aug. 15 for paving 8,000 sq. yds. of Front St. with brick, 1,800 ft. of granite curbing, etc. It is stated that about 2,000 bbls. of Portland cement will be used.

TACOMA, WASH.—Antone Berens has been awarded the contract for paving Pacific Ave. with fir blocks on a concrete foundation at $41,422, or $166 per lot. The other bidders were Charles King, $54,482; Nichols & Carothers, $44,751; estimated cost, $44,900.

MANUFACTURING PLANTS.

WINOOSKI, VT.—The Burlington Woolen Mill Co. is reported about to build a 60 × 200-ft. addition to its plant.

KENSINGTON, N. Y.—The Spalding Machine Screw Co. is reported as to enlarge its plant to twice its present capacity, for the purpose of manufacturing bicycle fittings.

POTSDAM, N. Y.—F. W. Moore is said to be endeavoring to establish an industry at this place for the manufacture of knit goods. A building has been secured and a stock company is to be formed under the name of the Potsdam Knitting Co., with a capital stock of $50,000.

SYRACUSE, N. Y.—Press reports state that a site has been purchased at Wolf and Free Sts. on which a large foundry will be erected by Howard M. Babcock, Treas. Rankin Boiler Co.

BEAVER FALLS, PA.—The directors of the Champion Saw Works are reported to have decided to enlarge the works and double the present capacity. Plans and specifications have been prepared.

BLOOMSBURG, PA.—A new mill is being built at this place to turn out worsted and woolen yarn for the Magee Carpet Works. About 150 hands will be employed. The company is in the market for artesian wells, automatic sprinklers, boiler and pipe covering, electric lighting apparatus, elevators, fire escapes, spinning machinery, steam engine, wool combing machinery, etc. Pres., Wm. Weaver.

CHARLEROI, PA.—A board of trade has been organized and is considering a proposition for the location of a bridge and structural iron plant at this place. The company asks for a free site 200 × 400 ft. and agrees to employ about 100 men at the start.

CONNELLSVILLE, PA.—It is stated that work will be begun within a few days on the Connellsville Sheet & Tin Plate Works, to be located at this place. The buildings are to cover seven acres, and the foundations are to be put down for six mills, four of which are to go into opertaion as soon as possible.

HONESDALE, PA.—The Irving Cliff brewery has been destroyed by fire; loss, $40,000.

McKEESPORT, PA.—S. Leek is reported to have patented a new kind of pipe and as organizing a company to erect a plant to manufacture same.——The McKeesport Brewing Co. has been organized for the purpose of erecting a large brewery in this city. Reports state that a site has been purchased, and work will soon be commenced. Address Alexander Dietrich.

PHILADELPHIA, PA.—The mill owned by John G. Hanifin, located at Savery and Thompson Sts., is to be enlarged in the near future.

POTTSTOWN, PA.—Bids are being received by Stanley G. Flagg & Co. for the erection of a large addition to the foundry at this place, according to reports.

VANDERGRIFT, PA.—All the buildings for the new plant of the Apollo Iron & Steel Co. will be of steel framework covered with corrugated iron, according to a press report. The main building, containing the sheet mills, will have two spans side by side, one measuring 80 ft. in width by 34 ft. in height, and 800 ft. long, the other being 60 ft. wide, 34 ft. high, and 800 ft. long.

LOWMOOR, VA.—Messrs. Shanahan, who lately leased the Buena Vista Furnace, at Buena Vista, Va., will erect a large stack for manufacturing pig iron near this place, according to press reports.

SUFFOLK, VA.—It is reported that a new brick factory is to be established here in the near future.

CHARLOTTE, N. C.—The Highland Park Mfg. Co., now operating a gingham mill at this place, will at once erect a spindle mill, to be run in conjunction with the present plant.

BURLINGTON, N. C.—The Elmira Cotton Mfg. Co., of this place, will erect a duplicate cotton mill and equip it with the latest improved machinery and an electric light plant. L. Banks Holt, a prominent mill owner of Alamance county, is interested.

MONROE, N. C.—The cotton mill of the Monroe Cotton Mills Co., purchased last week by O. P. Heath & Co., for $68,000, will be doubled in capacity in the near fupture by the new owners.

HAWRIVER, N. C.—The Cora Mfg. Co., of this place, will build cotton mill No. 2 near the site of the present mill, the main building to be 152 × 100 ft. It will be equipped with the best modern machinery and will include an electric light plant. The Messrs. Holt, who own several mills in Alamance county, are the principal owners, and can be addressed for particulars. Ex-Gov. T. M. Holt and his sons, and A. W. Haywood, of Hawriver, are also interested.

COLUMBIA, S. C.—Plans have been prepared by the Carolina Cotton Mills Co. for erecting a factory, three stories high, with iron roof, steam heat, electric lights and fire sprinklers connected with roof tank to contain between 10,000 and 12,500 spindles, etc., complete outfit for cotton mill, and set electric transmitting machinery for operating separate machinery, to be driven by water power; also for power house to contain set turbine or other waterwheels to produce at least 125 HP. A steam plant of 75 to 100 HP. will also be put in. Pres., E. W. Robertson.

ELBERTON, GA.—Col. T. C. Swift has bought the site of the Heardmont Cotton Mills, near Middleton, on Beaver Dam Creek, about seven miles from this place, and will erect a new cotton mill, to cost about $300,000, according to reports.

BUCYRUS, O.—The Shunk Plow Co. will contract for the erection of a new building some time this month, to be used for a foundry, blacksmith shop and engine room.

LORAIN, O.—It is stated that surveys have been completed by the Johnson Co. for new blast furnaces, to cost $500,000, the construction of which will be commenced at once.

HAMMOND, IND.—It is reported that a gas plant is to be erected here by the Hammond Gas Light & Power Co. H. H. Young, J. Ward and others, of Chicago, are interested.

DETROIT, MICH.—P. Doderichs, Arch., 23 Hunter Bldg., has prepared plans for a three-story and basement addition to the Exposition Brewing Co.'s plant, at Chase and Mechanic Aves. Specifications call for electric lighting, etc.

MENOMINEE, MICH.—A press report states that a number of saw and planing mills and 25,000,000 ft. of lumber have been destroyed by fire, causing a loss of nearly $500,000.

ST. LOUIS, MO.—I. S. Taylor, Arch., Columbia Bldg., has prepared plans for a number of tobacco factories for the Liggett & Meyer Tobacco Co., 1214 Washington Ave. The work projected will comprise 14 buildings, ranging from 150 to 200 ft. in length and from 50 to 100 ft. in width. The contract for excavation and stone foundations has been let to Samuel Hoffman for $240,000. Other contracts will be let during the next 60 days. The entire work will cost $1,200,000.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

DREDGING.—Toledo, O.—It is reported that bids will be asked in a few days for dredging a new channel in Swan Creek. L. P. Harris, Cy. Clk.

CEMENT.—Washington, D. C.—Bids are asked by the district commissioners until Aug. 15 for a supply of Portland hydraulic cement, as stated in our advertising columns.

REPAIRING PIER.—New York, N. Y.—Bids are asked by the department of docks until Aug. 13 for repairing the crib-bulkhead at the foot of East 17th St., East River.

REMOVING SHOALS.—Detroit, Mich.—Bids are asked until Sept. 6 for removing shoals, four contracts, as stated in our advertising columns. Col. O. M. Poe, U. S. Engr. Office.

FOG WHISTLES.—Detroit, Mich.—Bids are asked until Aug. 12 for furnishing 22 ten-inch steam fog

whistles, as stated in our advertising columns. Maj. M. B. Adams, U. S. Lighthouse Engr.

LEVEE WORK.—Greenville, Miss.—Bids are asked until Sept. 3 for the construction of about 600,000 cu. yds. of new levee and 300,000 cu. yds. of enlargement work. W. A. Everman, Secy. Miss. Levee Comrs.

STREET SIGNS.—Plainfield, N. J.—Bids are asked by the street committee for metal street signs, with 3-in. letters; bids and samples of signs to be submitted to the committee at the mayor's office Friday, Aug. 16, at 8 p. m. Robert A. Meeker, St. Comr.

NAVAL SUPPLIES.—Washington, D. C.—Bids are asked until Aug. 13 for a quantity of hardware, pig iron and other supplies for the Norfolk and Washington navy yards, and until Aug. 27 for supplies for the Mare Island navy yard. A. K. Michler, Acting Ch. of Bureau of Supplies and Acc'ts.

CEMENT AND CRIBWORK.—Ottawa, Ont.—Bids are asked until Aug. 16 for furnishing 2,500 bbls. of Portland cement for work on the Trent Canal, and until Aug. 19 for constructing about 300 ft. of cribwork in connection with work on the Lachine Canal. J. H. Balderson, Secy. Dept. Rys. and Canals.

STREET CLEANING.—Houston, Tex.—Bids are asked until Aug. 12 for cleaning the streets and gutters in the business portions of the city and removing the trash and garbage from the streets and sidewalks generally, including the flushing of the gutters, for one year from the date of awarding the contract. John T. Browne, Mayor.

PIER WORK.—Brooklyn, N. Y.—The following bids were received July 25 for extending the pier at the foot of Noble St.: Spearin & Preston, work, complete, $11,875; Barth S. Cronin, $11,000; Sandford & Stillman Co., $9,698; Wm. H. Jenks, $9,595; Richard Cronin & Son, $9,587; Moses Engel, $7,894. Alfred T. White, Comr. Cy. Wks.

STEAM ROAD ROLLER.—Plainfield, N. J.—Bids are asked by the street committee until Aug. 16 for furnishing the city with a 12½-ton steam road roller. Prices, terms of payment and specifications will be considered by the committee at a meeting in the mayor's office at 8 o'clock p. m., Aug. 16. Address Robert A. Meeker, St. Comr.

DAM.—Millbury, Mass.—A press report states that Fowler Bros., of Northbridge, have been awarded the contract for building the new dam for the Sutton Mfg. Co. across the Blackstone River at Pleasant Falls near the Millbury line. The old dam has been considered unsafe for years. The building of the new dam is looked upon by many as the first move in the direction of the building of the proposed new mill at Wilkinsonville.

SMOKE-PREVENTING DEVICE.—Rockford, Ill.—Chas. C. Stowell, Supt. W. W., writes us that the following bids were received some time ago for a smoke-preventing device, as advertised in Engineering News:

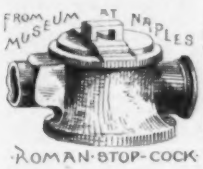
American Stoker Co., Dayton, O.—4 stokers, 1 engine, 1 face blower, and erection	$2,300
The Backus Co., 505 Fort St., West, Detroit, Mich.—Use of patent for each boiler	200
Additional to change boilers, exclusive of grates	100
The Brightman Stoker Co., 17 Michigan St., Cleveland, O.—4 stoker furnaces, 1 engine, fronts and doors, and erection	1,550
Jas. V. Burke, 933 Monadnock Blk., Chicago, Ill.—2 furnaces, full fronts, grates and erection.	1,200
Earl S. Claire, Portsmouth, O.—Fire brick furnace, each	400
A. W. Colwell, 39 Cortlandt St., New York—Down-draft water-tube furnaces, ready for work, each	650
Dorrance Grate Co., 518 Western Union Bldg., Chicago—4 Dorrance smokeless furnaces, including grates, fronts and mason work	2,000
Engineering Improvement Co., 1239 the Monadnock, Chicago—Thomas smokeless furnace, each	225
Hawley Down Draft Furnace Co., Security Bldg., Chicago—Grates, furnace, new fronts, connections and mason work, each	650
Robert P. Steele Co., 104 Fifth Ave., Pittsburg, Pa.—Walker smokeless furnace, 4 set grates and all work	1,275
Simmons & Miller, 1401 Monadnock Blk., Chicago—Smith's duplex smokeless furnace, each.	150
S. T. White, 17 La Salle St., Chicago, Ill.—"Orris water arch" for 2 boilers	1,300

The city received other letters, but without proposals. The committee did not accept any bid, but instructed the superintendent to place grates in the two new boilers of some approved pattern. The matter of a smoke-preventing device will be taken up at some indefinite period in the future.

TUNNEL.—Pittsburg, Pa.—A correspondent writes us that local papers state that a company has been formed to tunnel through Boyds Hill from Chestnut St. to Tenth St. bridge, making a tunnel 600 ft. long. Congressman John O'Neil is interested.

REMOVING WRECK.—Boston, Mass.—The contract for the removal of the wrecked steamship Venetian in Boston Harbor, as advertised in Engineering News, has been awarded by the harbor commissioners to G. W. Townsend, of Boston, for 99% of what can be got out of the wreckage. The commissioners stated in the specifications that the contractor should designate the method by which he intended to remove the wreck, and further agreed that the wreckage should go to the contractor. The other bids were as follows: Stewart & Co., Boston, $15,000; J. F. Wiswall, Boston, $4,150; Chapman Derrick & Wrecking Co., New York, $4,829; Charles W. Johnson, Dorchester, $13,000; Boston Tow Boat Co., $8,970; Perkins & White, Boston, $9,300; R. M. McDonald, Boston, $2,300; John Mullen, Boston, $10,000.

CONTRACT PRICES.



WATER WORKS.—Warsaw, N. Y.—The successful bidders for constructing water-works at this place, as advertised in Engineering News, were noted last week under Water-Works. The prices were as follows: F. B. Hawkins & Co., Boston, pipe, $20.15 per ton for 4-in., $19.15 for other sizes, and 1.9 cts. per lb. for special castings; Detrick Supply Co., St. Louis, 2-nozzle Corey hydrants at $22.75 each; Rensselaer Valve Manufacturing Co., Troy, $7.15, $12.15, $17.50, $25, and $31 each, respectively, for 4, 6, 8, 10 and 12-in. valves, and $2.50 for valve boxes; Chandley Bros. & Co., Beaver Falls, Pa., 14, 16, 20, 24 and 26 cts. per ft., respectively, for laying 4, 6, 8, 10 and 12-in. pipe. Engrs., Voorhees & Witmer, Buffalo, N. Y.

SEWERS.—Huntington, Ind.—Contracts for constructing sewers have been awarded as follows: J. B. Williams, Huntington, Ind., 26 × 39-in. brick, $2.19 per lin. ft.; 24-in. pipe, $1.31; 20-in., $1.11; 18-in., $1.08. Jerry Shea, Wabash, Ind., 18, 12 and 10-in. pipe, $1.52. J. B. Vernon, Cy. Engr., writes us that the other bidders were Fisher, Bailey & Keefer; Draper & Weeling and Jos. Kendler, all of Huntington, Ind.

DREDGING.—Brooklyn, N. Y.—W. E. Belknap, Asst. Engr. Wallabout Improvement, informs us that the following bids were received July 30 for dredging a channel and site for piers and slips on Wallabout market lands, as advertised in Engineering News, (1) being price per cubic yard for Part 1, about 212,000 cu. yds., and (2) price for Parts 1 and 2, about 453,000 cu. yds.:

	1.	2.
R. G. & J. S. Packard	$0.32	$0.29
P. Sandford Ross	0.31⅜	0.28¾
International Contracting Co.	0.27⅞	0.21⅞

CAST IRON PIPE.—Brooklyn, N. Y.—The following bids were received Aug. 5 for cast iron pipe, as advertised in Engineering News, the price being per ton of 2,240 lbs.:

	8-in., 950 tons.	12-in., 910 tons.	20-in., 150 tons.	Specials, 228,480 lbs.
Anniston P. & F. Co.	$23.91	$23.91	$22.79	$.02
Chas. Millar & Co.	24.08	24.08	24.08	.02¼
R. D. Wood & Co.	23.40	22.90	22.40	.02½
*Warren F. & M. Co.	22.80	22.80	22.80	.02¾

* Combined bid of the Warren Foundry & Machine Co., McNeal Pipe & Foundry Co., and the Reading Foundry Co.

BRICK PAVING.—Lorain, O.—L. A. Fauver, Engr., informs us that the following bids were received July 25 for paving Broadway and Pentield Ave. with brick on 6 ins. concrete or 10 ins. broken stone foundation, as advertised in Engineering News:

Bids Received at Lorain, O., July 25, for Paving with Brick.

Bidder.	Brick or block.		Curbing.	Tileing.	Grading.	Cushions.—1½-in.	Cushions.—2-in.	Boiling & fitting.	Fillers,—Murphy grout.	Fillers,—Concrete.	Prtld cement.	Foundations,—Concrete.	Foundations,—Broken stone.
Kinnear & Graham, Columbus, O.	$0.72	to $0.95	$0.30	$0.03	$0.20	$0.02	$0.03	$0.01	$0.14	$0.15	$0.10	$0.25	$0.28
A. G. Pugh & Co., Columbus, O.	.70	" .91	.32	.05	.18	.05	.06	.01	.15	.22	.16	.45	.40
Rosser & McCrady, Akron, O.	...	...	.34	.05½	.25	.04	.04	.08	.16	.18	.09	.60	.60
Straub & Tischler, Mansfield, O.	.68	" .83	.34	.10	.24	.02½	.03	.01	.16½	.10	.12	.40	.43
Davis & Cadwell, Youngstown, O.	.70	" .80	.26	.10	.26	.04	.06	.02	.15	.20	.15	.50	.40
W. A. Adams, Allegheny City, Pa.	.77	" .95	.35	.05	.25	.05	.05	.03	.15	.08	.06	.50	.45
Albion Stone Co., Cleveland, O.	.68	...	.33	.04½	.23	.04	.06	.02½	.15½	.15	.13	.58	.53
W. J. Gawn, Cleveland, O.	.68	" .96	.28	.04	.19½	.02¾	.03½	.01	.15	.15	.14	.60	.45
Pierce & McDowell, Lorain, O.	.62	" .70	.27	.05	.22	.02	.02½	.02	.15	.18	.12	.45	.50
W. H. Patchett, Cleveland, O.	.80	" .92½	.28½	.03	.25	.02½	.03	.01	.17½	.24	.24	.75	.45
M. J. DeCelle, Cleveland, O.	.60	...	.30	.07	.25	.08	.10	.04	.17	.21	.17	.63	1.25
McCloud & Geigel, Columbus, O.	.60	" .77	.32	.05	.22	.04	.05	.01	.15	.11	.09	.42	.33
T.B. Townsend B'k Co.,Zanesville,O.	.70½	...	...	...	.20	.02	.03	.00½	.15	.10	.06	.40	.27
Duffy, Piero & McKinney, Canton, O.	.67	" .80	.29	.04	.20	.03	.03½	.01½	.16	.16	.13	.40	.25
Dan Easton, Elyria, O.	.60	" .75	.33½	.12	.40	.05	.06	.02	.18	.22½	.18	.60	.45
Chas. W. McKinney, Toledo, O.	.68	" .85	.35	.02	.16½	.02	.02¼	.02	.16	.18	.13	.32	.28
O. W. Gardner & Barnett,Bellaire,O.	.63	" .75	.29	.05	.18	.04	.03	.05	.16	.14½	.10	.42	.29

PAVING AND MACADAMIZING.—Indianapolis, Ind.—The contracts for asphalting St. Clair St. were let July 23 to the Indiana Bermudez Asphalt Co., in two sections. One section was let at $4.75 a lin. ft. of each side of the street, other bids being $4.80 and $4.94. This section is 222 × 27 ft., has 2,359 sq. yds. of asphalt on Portland cement concrete, 1,328 ft. of stratified limestone curb, 82 ft. of granite round corners, 127 ft. of marginal stone, 2 catchbasins and 10 inlets. The second section was let at $4.23, other bids being $4.31 and $4.38. This section is 3,535 × 24 ft. and has 9,859 sq. yds. of asphalt, 6,642 ft of stratified limestone curb, 332 ft. of granite round corners, 590 ft. of marginal stone, 2 catchbasins and 25 inlets.

SEWERS.—Toledo, O.—The following bids were received July 29 for constructing a sewer in Utah St. from First St. to sewer No. 271 in Nevada St.:

Bidder.	8-ft. brick.	Manholes.	C. basins.	12 in. pipe.	15-in. pipe.	Extra sand.	Total.
Andrew Maher	$1.25	$12.00	$38.00	$0.50	$0.60	$5.00	$2,814
John Degnan	1.25	12.50	45.00	.60	.70	4.00	2,878
H. P. Streicher	1.10	6.00	30.00	.60	.70	4.00	2,438
F. E. Cole	1.35	7.00	38.00	.45	.75	4.00	2,973
G. H. Bodette	1.12	12.00	40.00	.50	.75	4.00	2,583
H. J. Bower	1.08	8.00	29.00	.50	.65	4.00	2,396
Neil Huston	1.30	15.00	40.00	.60	.70	8.00	2,970
Wm. J. McMahon	1.35	10.00	30.00	.40	.60	3.00	2,934
Thomas Kelley	1.01	8.00	30.00	.55	...	5.00	2,258
A. G. Wright	.85	9.00	35.00	.55	1.00	5.00	2,222

SEWERS.—Wilmington, Del.—T. Chalkley Hatton, Engr., writes us that the contracts for constructing brick and pipe sewers, as advertised in Engineering News, have been awarded to John Jacoby, of Wilmington, at the following prices for the eight contracts: $1,259, $1,426, $3,619, $4,005, $4,575, $9,316, $10,592 and $13,037. The detailed bids for one of the contracts were as follows:

Bids Received at Wilmington, Del., for Constructing Brick Sewer.

Bidder.	57-in. brick sewer, 500 lin. ft.	54-in. brick, 206 ft.	36-in. brick, 265 ft.	29 x 39-in. brick, 331 l.f.	6-in. slants, 140.	Inlets, plate E, 2.	Inlets, plate F, 15.	Junc. manholes, 9.	Rock excavation, 300 cu. yds.	Vit. fire brick for invert, 29 M.	Days to complete, $5 per day.	Total.
Department's estimate	$5.72	$5.82	$4.01	$3.91	$0.14	$32.44	$40.07	$41.98	$2.41	$20.99	90	$9,488
Joseph Jenkins, Wilmington, Del.	6.10	5.90	4.44	4.22	.40	50.00	55.00	60.00	2.75	7.15	90	10,404
John Jacoby, Wilmington, Del.	6.25	7.50	4.25	3.75	.50	40.00	50.00	48.00	3.00	18.00	45	10,592
Ward & Stucker, Harrisburg, Pa.	15.00	15.00	11.00	10.00	.25	40.00	40.00	50.00	4.00	32.00	90	21,651
Lynn & Philips, Wilmington, Del.	7.75	7.70	6.75	5.00	.25	45.00	50.00	64.00	2.75	28.00	100	13,211
Jones, Pollard & Co.,Philadelphia, Pa.	6.95	6.58	5.15	4.69	.50	28.00	43.00	35.00	1.25	24.00	90	10,956
John McCann, Philadelphia, Pa.	7.30	7.30	6.00	6.00	.25	70.00	63.00	70.00	3.25	20.00	100	13,210
B. J. Sullivan, Philadelphia, Pa.	7.50	7.50	4.25	3.75	.40	40.00	55.00	55.00	2.00	24.00	90	11,552
A.S.Reed & Bro. Co.,Wilmington, Del.	6.65	6.33	3.76	4.36	.22	17.00	47.00	39.00	3.00	27.00	100	10,882

RETAINING WALL.—Wilmington, Del.—The following bids were received July 27 for building about 300 cu. yds. of retaining wall along the line of the Park Driveway, back of school No. 24: Patrick Fahey, $4.50 per cu. yd.; Lynn & Phillips, $5; John Jacoby, $5.75; A. S. Reed & Bro. Co., $6.23; Isaac S. Talley, $7; Edgar Ziellan, $7.70; Delaware Construction Co., $9.80; John Carr, $10.50; Robert R. Morrison, $12.50.

GRADING.—Boston, Mass.—The following bids were received Aug. 2 for excavating, removing material and grading Blue Hill Ave., section 1, ward 24, the specifications calling for (1) excavating 6,000 cu. yds.; (2) extra haul, 3,000 cu. yds. hauled ½ mile; (3) loam rehauled; (4) removing trees:

	1.	2.	3.	4.
Davern & Cronin	$0.35	$0.20	$0.30	$200
Thomas Minton	.55	.30	.25	100
James Dolan	.85	1.00	.50	...
D. F. O'Connell	.40	.30	.45	200
H. P. Nawn	.34	.15	.15	50

For excavating (1) 7,000 cu. yds.; (2) extra haul, 400 cu. yds.; (3) 200 cu. yds. loam rehauled; (4) removing trees on sections 7, 8 and 9, Blue Hill Ave., the bids were as follows:

	1.	2.	3.	4.
D. F. O'Connell	$0.48	$0.24	$0.30	$200
Collins & Ham	.33	.15	.40	150
Davern & Cronin	.30	.24	.30	100
James McGovern	.35	.15	.20	50

LEVEES.—Memphis, Tenn.—Capt. Graham D. Fitch, U. S. Engineer Office, received the following bids July 29 for the construction of a levee in the White River levee district; section 1 being station 1,490 to 1,565; 2, station 1,565 to 1,625; 3, station 1,625 to 1,699; 4, station 1,699 to 1,775; 5, station 1,775 to end of J. C. Hodge contract:

Bidders.	1. cts.	2. cts.	3. cts.	4. cts.	5. cts.
T. S. Aderholdt	17.00	16.90	14.74	14.24	15.30
Batt O'Brien	16.99	16.99	15.75	17.99	13.89
C. F. De Gans	14.98	15.00	13.45	13.10	14.20
W. L. Withers	.....	.....	13¾	.....	14.90
McBain & Co.	18.00	16½	12⅝	14⅝	15⅞
Moore & Wash	14.45	17½	12¼	18.00	14.90
Manning & Gibson	.....	.....	16.00	.....	16.00
J. C. Hodge	.....	.....	.....	.....	14½
L. C. Dresbach & Co.	14¼	15.00	14.00	139	14½
B. F. Lamb	17½	17.00	17.00	15.95	16½
J. H. McTighe & Co.	15.00	15.25	15.50	15.25	17.75
Johnson & Outzen	14.24	14.40	12.24	13.24	12.24
W. A. Shippy	17.00	16.00	15.00	14¼	14.00
C. H. Dameron	17.00	15⅞	16.00	17.00	15.00
Timothy Sullivan	.....	.....	13¾	.....	.....

RESERVOIR.—Washington, D. C.—We are informed that the following bids were received by the district commissioners July 31 for completing the Fort Reno reservoirs, as advertised in Engineering News; address of each bidder is Washington, D. C.:

Bidders.	Excavation, per cu. yd.	Concrete masonry.—Granite and stone, cu. yd.	Concrete masonry.—Stone alone, per cu. yd.	Concrete masonry.—Gravel alone, per cu. yd.	Asphalt coating, sq. yd.	Asphalt keys, per cu. ft.	Valve house.
M. F. Talty	$0.60	$11.80	$11.50	$11.50	$0.15	$2.00	$3,100
Manning & Parsons	.375*	8.57	*8.72	*8.32	.18	2.50	2,487
J. McCarthy	.339	9.51	9.48	9.546	.17	3.19	2,390
C. H. Eslin	.27	8.97	9.07	8.97	...	...	2,222
W. E. Chaffee	.33	9.57	9.77	9.20	.33	2.00	550
M.McNamara & Co.	.35	10.00	10.00	10.00	.20	2.75	2,757
Lyons Bros.	.39	9.15	9.25	8.74	.23	3.16	2,890

* $8.57 and $9.32; $8.72 and $9.47; $8.32 and $9.07.

METAL MARKET PRICES.

LEAD.—New York: 3.55 to 3.6 cts. Chicago: 3.35 to 3.37 cts. St. Louis: 3.32 to 3.4 cts.

BARB WIRE.—Pittsburg: $2.10, $2.15 and $2.25 for galvanized, and $1.5 and $1.6 for plain in carload and less than carload lots at mill.

FOUNDRY AND PIG IRON.—New York: $12 to $14. Pittsburg: $11.50 to $14.50. Chicago: $12.50 to $14.

TRACK MATERIAL.—New York: angle bars, 1.4 to 1.45 cts.; spikes, 1.8 to 1.85 cts.; track bolts, 2 to 2.2 cts. with square, and 2.1 to 2.2 cts. with hexagon nuts. Chicago: angle bars, 1.45 to 1.55 cts.; spikes, 1.8 to 1.9 cts.; track bolts, 2.15 to 2.25 cts. with square, and 2.3 to 2.4 cts. with hexagon nuts.

NAILS.—Pittsburg: $2.05 per keg for carload lots and $2.15 for less than carload lots, for wire nails at mill; $1.80 and $1.85 for cut nails at mill. Chicago: $2.20 and $2.30 for wire nails, $2 and $2.05 for cut nails. New York: $2.20 and $2.30 for wire nails, and $1.95 and $2.06 for cut nails.

RAILS.—New York: $24 at eastern mills and $24.75 at tidewater; old rails, $13.50 to $15 for iron, and $11.50 to $12 for steel; light rails, $24; girder rails, $26. Pittsburg: $22 for standard sections of 45 lbs. and over; $23 for light sections; old rails, $15 to $15.50 for iron and $13 to $14 for steel. Chicago: $25 to $27 for standard sections; $25 for light sections; old rails, $15 to $15.50 for iron and $11 to $12 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.65 to 2.1 cts.; channels, 1.65 to 1.75 cts.; angles, 1.5 to 1.6 cts.; tees, 1.8 to 1.9 cts.; universal mill plates, 1.75 to 1.8 cts.; steel plates, 1.75 to 1.9 cts. for tank, 1.8 to 1.95 cts. for shell, 1.95 to 2.05 cts. for flange, 2.1 to 2.25 cts. for ordinary firebox, 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.5 to 2 cts.; channels, 1.5 to 2 cts.; angles, 1.4 to 1.45 cts.; tees, 1.5 to 1.6 cts.; Z-bars, 1.55 to 1.65 cts.; universal mill plates, 1.6 to 1.7 cts.; steel plates, 1.7 to 1.8 cts. for tank, 1.9 to 2 cts. for shell, 2 to 2.1 cts. for flange, 2 cts. for ordinary firebox, and 2 to 4 cts. for locomotive firebox. Chicago: beams, 1.7 to 1.8 cts.; channels, 1.7 to 1.8 cts.; angles, 1.6 to 1.7 cts.; tees, 1.75 to 1.85 cts.; universal plates, 1.95 cts.; steel plates, 1.95 to 2.1 cts. for tank, 2.25 to 2.4 cts. for flange, 2.6 to 2.75 cts. for ordinary firebox, and 4.5 to 4.75 for locomotive firebox.

IRON AND STEEL.—The New York "Journal of Commerce" says that in the pig iron market there is little activity outside of deliveries on old orders, but the moderate sales relieve the market sufficiently to keep prices very steady in the face of large output of furnaces. By all accounts the consumption is heavy and foundry men are still well off for orders. Few orders are being placed in this quarter for steel rails and purchases of spikes are on a rather small scale, but prices in both lines remain firm. Inquiries for structural shapes, plates and ordinary merchant iron are very fair. Not a great deal of business transpires, but it is at firm prices. There is still a very fair demand for old rails and wrought scrap iron, with stiff prices bid, but scarcity of stock in this vicinity keeps prices low. Other old material is firmly held, but in limited demand.

INDUSTRIAL NOTES.

THE UNION CAR WORKS, of Buffalo, N. Y., has an order for 500 coal cars for the Beech Creek R. R.

THE BUFFALO CAR WORKS, of Buffalo, N. Y., has an order for 250 coal cars for the Beech Creek R. R.

THE WRIGHT ENGINE WORKS, of Newburg, N. Y., has been purchased by Samuel McMillan, of New York, for $57,000.

THOMAS CARLIN'S SONS, of Pittsburg, Pa., have built a number of concrete mixing boxes for U. S. Engineer work in the South.

THE NATIONAL TUBE WORKS CO., of McKeesport, Pa., has been notified of the safe arrival of its shipment of water pipe in Japan.

THE NILES TOOL WORKS, of Hamilton, O., has placed contracts for the construction of a foundry 436×300 ft., containing five cupolas.

THE CARTER BRAKE CO., of Chicago, Ill., has completed its works for the manufacture of the Carter brake for electric and cable street cars.

THE WHITE HILL FOUNDRY & ENGINE WORKS, of Newburg, N. Y., has been sold to W. C. Doran, of New York, for $92,000. The plant cost about $200,000.

THE WESTERN FILTER CO., of St. Louis, Mo., has had application made for the appointment of a receiver. The company was incorporated in March, 1893.

WEBSTER, GILLESPIE & CO., brick manufacturers, of Philadelphia, Pa., have made application for the appointment of a receiver and the winding up of the concern.

THE INDIANA BRIDGE WORKS, of Muncie, Ind., is supplying the structural work for some lighthouses to be erected along the Lakes, and is working double time with a night shift.

THE LAKE ERIE IRON CO., of Cleveland, O., will enlarge its property by filling in between Whiskey Island and the mainland, and erect blast furnaces on this land. A steel plant is also contemplated. Pres., W. C. Scofield.

SCRANTON & CO., of New Haven, Conn., are introducing a new pattern of vertical power hammer for drop forging and other work. It is 5 ft. 8 ins. high, can strike 400 blows per minute, and will take dies up to 5×6 ins. in size.

THE GOLD STREET CAR HEATING CO., of New York, has been incorporated, with a capital stock of $200,000, to introduce a new electric heater, and the Gold hot-water heating system, as used on the Third Ave. cable railway.

THE ROLLING STOCK of the narrow gage Kansas Central R. R. is to be sold at auction by the New York Security & Trust Co., as receiver. The order was made by Judge Williams, of the U. S. Circuit Court, at Topeka, Kan.

THE UNION DRAWN STEEL CO., of Beaver Falls, Pa., has placed a contract for the erection of two additional brick and iron buildings, each 50×110 ft., which will increase the annual capacity of the works to 18,000 tons of cold rolled shafting, etc.

CURRAN & HUSSEY, engineers and contractors, of Pittsburg, Pa., inform us that they have received from the Shiffler Bridge Co., of Pittsburg, the contract for the erection of the 800-ft. rolling mill building of the Apollo Iron & Steel Co., at Vandergrift, Pa.

MOHN & HOFF, engineers and contractors for buildings, bridges and steel structural work, have been awarded contracts for the ironwork for and the erection of the Wicker Park Hall Building, North and Milwaukee Aves., the new Cook county jail, and for the additions and improvements to the Major Block, Chicago, which is to be made into a seven-story structure.

BURNS & ESSON, 314 Chamber of Commerce Building, Chicago, is the firm name adopted by Robert M. Burns and John H. Esson, under which they will conduct a general contracting business, making a specialty of municipal work. They have been awarded the contract for paving North Fifth Ave., Chicago, and have recently completed 1¼ miles of brick paving at La Grange, Ill.

THE POST, JACOBI & BRUNING CO., Lakeside Building, Chicago, Ill., has succeeded the firm of Post & Jacobi, dealers in all kinds of engineering and architectural supplies, and will continue in the same line of business, increasing the stock and enlarging the scope of the business by establishing branch houses. Pres., F. Post; Secy. and Treas., Lionel Jacobi; Vice-Pres., C. Bruning.

P. H. LAUFMAN & CO., proprietors of the Apollo Sheet Iron Works, Apollo, Pa., have secured control of the plant of the Saltsburg Rolling Mill Co., Saltsburg, Pa. The plant comprises one pile and one combination furnace, three sheet furnaces, three pair furnaces, a 22-in. bar train, a sheet train and two pairs of sheet shears. The plant has a capacity of about 6,000 tons of sheets per year, and with this addition to their plant Laufman & Co. will have an annual capacity of 14,000 tons of fine sheets.

THE C. E. WOODS CO., Monadnock Block, Chicago, Ill., has succeeded the firm of C. E. Woods & Co., and been incorporated with a capital stock of $100,000. Clinton E. Woods and Charles E. Corrigan are the members of the new concern. They state that they will take up a class of heavy electrical engineering and enlarge the scope of the business by opening offices in New York, San Francisco and Tokio, Japan. The company now has contracts with three large manufacturing companies to act in the capacity of consulting engineers, and a large amount of miscellaneous work in general engineering.

THE BALDWIN LOCOMOTIVE WORKS, of Philadelphia, Pa., has built for the Paulista Railway, of Brazil, six consolidation, four-cylinder, compound engines. The cylinders are 15×28 and 25×28 ins.; driving wheels, 50 ins. diameter; boiler, 76 ft. diameter and 12 ft. long, carrying a pressure of 180 lbs. The engines weigh about 65 tons light, on a driving wheelbase of 14 ft., and can pass curves of 300 ft. radius. The gage of track is 5 ft. 3 ins. It has also built two powerful ten-wheel engines for the San Francisco & San Joaquin Valley R. R.; these have cylinders 19×24 ins., and weigh about 65 tons, or nearly 100 tons for the engine and tender loaded.

THE GOULDS MFG. CO., of Seneca Falls, N. Y., reports sales of a number of its triplex pumps for pumping water supply, feed water, paper pulp, calcium brine, etc. For the New Orleans Railway & Mill Co., of New Orleans, La., it has built a triplex pump, with cylinders 5×8 ins., the pump being operated by a direct-geared electric motor mounted on the same bedplate. The company also reports that it has sold to the city of Memphis, Mo., a water-works pump having a daily capacity of 375,00 gallons; to the city of Oregon, Ill., a triplex water-works pump having a daily capacity of 750,000 gallons; and also a triplex pump having a daily capacity of 375,000 gallons to supply water to Linsdale, Ga.

THE CARSON TRENCH MACHINE CO., of Boston, Mass., states that it has leased trench machines to the following cities or contractors during the past two weeks: H. J. Reilly, White Plains, N. Y., machine for pipe sewer work; Wilson & Strack, Cincinnati, O., double machine, hoisting eight tubs at a time, for a wide trench; P. H. Harrison & Sons, Bloomfield, N. J., special machine for pipe sewer work; city of Boston, sewer division, pipe sewer machine; Subway Commissioners, Boston, special trench machine; Cambridge Water Board, traveling cableway for unloading gravel train; Brigham & Cates, Brockton, Mass., standard trench machine; C. H. Porter, Maywood, Ill., new Carson-Pilcher excavator. The company reports it has recently established a branch office in Chicago in the Chamber of Commerce Building, of which Mr. Wm. T. Cochran has charge.

NEW COMPANIES.—Pacific Wharf & Storage Co., Los Angeles, Cal.; $100,000, all paid in; A. McNally, W. J. Kengel and Thomas Vingus.

Globe Machine Co., Chicago, Ill.; $75,000; E. M. Gage and Milton A. Sherman.

Lafayette Equipment Co., Chicago, Ill.; $20,000; Frank M. Cary, John J. O'Leary and Chas. J. Fellows.

Iron City Stone Co., Allegheny, Pa.; $50,000; E. A. Knox, Geo. W. Crawford and Martin McCandless.

American Telegraph Supply Co., Atlanta, Ga.; $50,000; David M. Dunn, Frank J. Hoyle and S. H. Howell.

Superior Foundry Co., Little Falls, N. Y.; $20,000; Victor Adams, C. W. Vosburg and F. H. Burrows.

Gaskins Car Coupler Co., Charleston, W. Va.; Wm. E. Daniel, Jasper N. Parker, and Thos. Gaskins, of Arcadia, Fla.

Universal Heating & Cooling Co., New York city; $1,000; W. C. Baker, Mary A. Dean and Eustace Conway.

Aransas Pass Harbor, Dock & Wharf Co., Aransas Pass, Tex.; $250,000; J. B. Dibbell and Emil Moss Mosheim.

Champion Automatic Car Coupler Co., Kenton, O.; $100,000; Geo. L. Carter, Thos. A. Taylor and G. W. S. Austin.

Chas. R. Sayre Co., Montrose, Pa.; $8,000, with $800 paid in; hot air furnaces, pipe, castings, etc.; Treas., Chas. R. Sayre.

Elizabeth Telephone Co., Elizabeth, N. J.; $30,000, with $10,000 paid in; Charles Russ, Chas. E. Pountney and P. H. Gilhooly.

Rose Creek Mining Co., San Francisco, Cal.; $1,000,000, with $500 paid in; C. S. Benedict, James O'Connell and Henry A. Brown.

King Car Co., Scranton, Pa.; $100,000; S. D. King, of Dunmore, Pa.; Thomas H. Watkins and Clarence D. Simpson, of Scranton, Pa.

The Home Standard Telephone Co., Rochester, N. Y.; $350,000; Henry Russell, Wm. Barnes and Charles A. Whitney, of Albany, N. Y.

Western Switch Co., Denver, Colo.; $48,000; to control the patents of J. S. Meyers; E. L. Kern, Stephen Meyer and Allen B. Seaman.

Northwest Construction Co., Portland, Me.; $1,000,000; railways and telegraph lines; T. H. Curtis, George Taylor, Jr., and F. R. Strong.

Southern Pine Co., Savannah, Ga.; $1,250,000; B. A. Denmark, of Savannah; Henry P. Talmadge and James Stillman, of New York city.

Fales Grate & Heating Co., Portland, Me.; $200,000; Pres., George L. Weil, of Winthrop, Mass.; Treas., Byron Elder, of Boston, Mass.

Sanitary Construction Co., New York city; $25,000; Warren B. Paige, Newtown, Mass.; Wm. F. Morse and R. E. Parraga, New York city.

La Salle Construction Co., St. Louis, Mo.; $2,000, with $1,000 paid in; roads, street railways, etc.; James Adkins, L. L. Booker and J. H. Roach.

Sandy Hill Power Co., Sandy Hill, N. Y.; to manufacture paper pulp; $100,000; John H. Derby, J. Edward Howland, and Greenville M. Ingalsbe.

Crandall Electric Signal Co., Jersey City, N. J.; $5,000; Lucien S. Crandall, Parish, N. Y.; James Curran, Hoboken, N. J.; Geo. B. Fe.ds, Jersey City, N. J.

Piedmont Big Vein Coal Co., Windom, W. Va.; $30,000, with $600 paid in; M. J. Hoban, of Western Port, Md., and J. T. Laughlin, of Windom, W. Va.

Croton Quarry Co., Cortland, N. Y.; $50,000; John M. Burke, of Scranton, Pa.; John H. J. Gleason, of Flushing, N. Y., and Clinton T. Roe, of Pottsdam, N. Y.

John N. Robins Co., Brooklyn, N. Y.; $50,000; boilers, pumps and machinery; Harry G. Lytle and W. Y. Galliers, of Brooklyn; John N. Robins, of New York city.

Great Eastern Gold & Silver Mining & Milling Co., Portland, Me.; $1,000,000; Pres., W. A. Baker, of Cambridge, Mass.; Treas., Carl Biesenbach, of Boston, Mass.

Ontario Car & Truck Co., Oswego, N. Y.; $500,000, with $300,000 paid in; car trucks, ventilators, seats, etc.; Charles Thompson, Geo. W. Brooker and Howard Wilcox.

Delaware County Gas Mfg. Co., Camden, N. J.; $250,000, with $1,000 paid in; John W. Baker and John J. White, of Philadelphia, Pa.; Lewis Starr, of Woodbury, N. J.

United States Filtering & Purifying Co., Camden, N. J.; $600,000, with $1,000 paid in; Geo. H. Sellers, Geo. A. Fletcher and C. Wm. Berguer, all of Philadelphia, Pa.

John Hammond & Co., San Francisco, Cal.; $300,000, all paid in; railway and electrical machinery and supplies; John Hammond, James H. Mooney, and Manton E. Hammond.

Massachusetts Granite Pressed Brick Co., Fitchburg, Mass.; $300,000; Pres., H. B. Damon, Treas., Allen Sheldon, both of Boston; Secy., George L. Rice, of Leominster, Mass.

American Metallic Packing Co., New York city; packing for valves and piston rods; $50,000; A. C. Ewen and Wm. T. Allen, of Brooklyn, N. Y.; Louis H. Clark, of Fond du Lac, Wis.

THEY DID NOT ADVERTISE IN ENGINEERING NEWS.

From our Construction News columns we notice that Cape Vincent, N. Y., received only three bids for constructing a complete system of water-work, at $22,276, $28,508 and $30,231, according to statements in other papers. This work was advertised only in daily and local papers. A short advertisement in Engineering News would have cost only a few dollars and, bringing the work to the attention of nearly every prominent water-works contractor in this country, might have saved several thousand dollars on the contract.

The city of Marion, O., has opened bids for 15,152 sq. yds. of brick paving. Only two bids were received. A short advertisement, costing only a few dollars, in Engineering News might have saved this city a considerable sum of money on this contract.

Note—Brick paving contracts advertised in Engineering News, Waukegan, Ill., April 2, 15,300 sq. yds., received 30 bids; July 15, 10,365 sq. yds., received 10 bids; also Lorain, O., July 25, received 17 bids, as noted in another column.

Lack of space prevents further comments this week.

128 BIDS RECEIVED.

Morristown, N. J., Aug. 3, 1895.

Engineering News Publishing Co.,
New York City.

Gentlemen: We received 128 bids on our road work, and the number of inquiries was about the same. We had applications from as far as Canada, from Illinois and from Spokane, Wash.

Yours truly,
J. C. WHITE, County Clerk.

MORE THAN 150 REPLIES were received, an engineer writes us, from a recent insertion of a water-works advertisement in Engineering News.

FACTS WORTH CONSIDERING.

Engineering News is probably read by a greater number of prominent contractors each week than are any other five papers in this country. It prints more reliable news items and a larger number of proposal advertisements than any other paper. The columns of this paper are invaluable if one wishes healthy competition for furnishing materials or for construction. Contract work of all kinds should be advertised in Engineering News.